

TEKTRONIX®

**1421
PAL
VECTORSCOPE**

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97005

Serial Number _____



WARRANTY

All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

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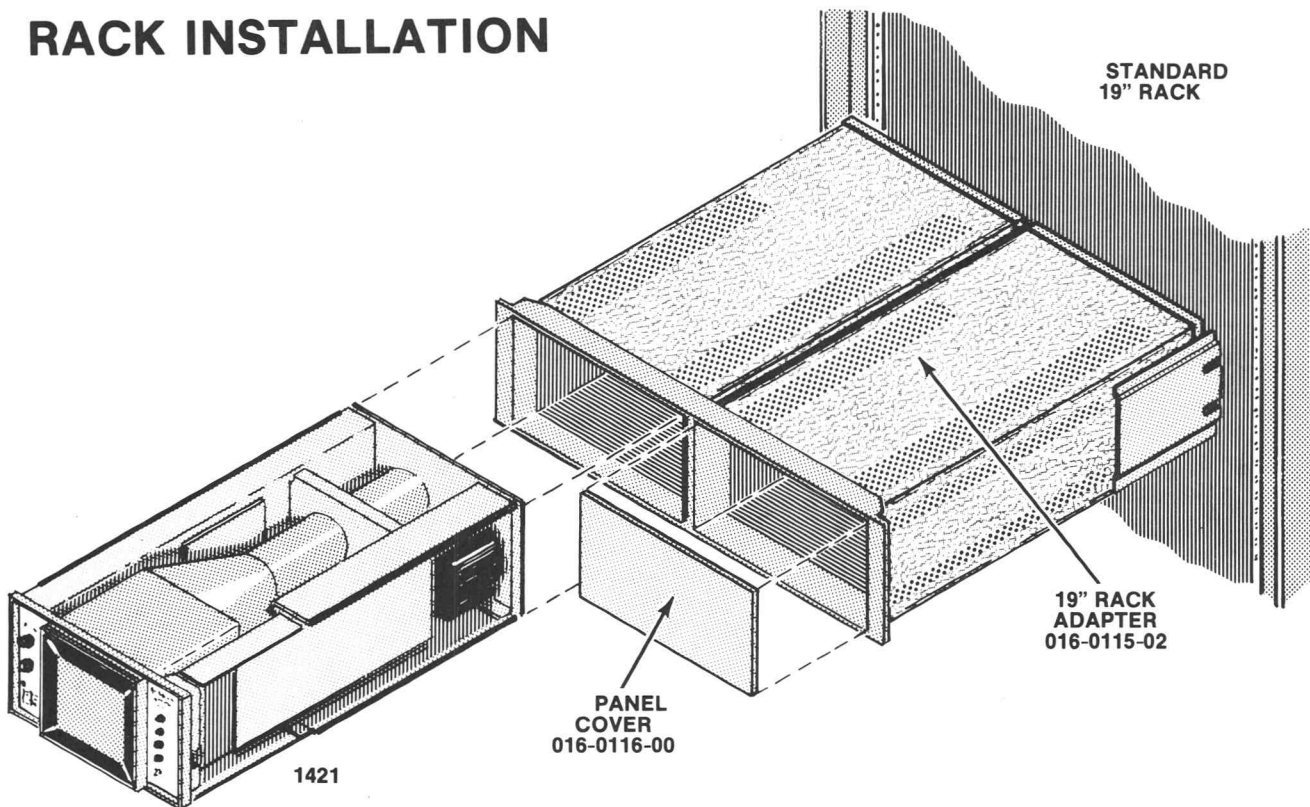
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RACK INSTALLATION



Rackmounting the 1421

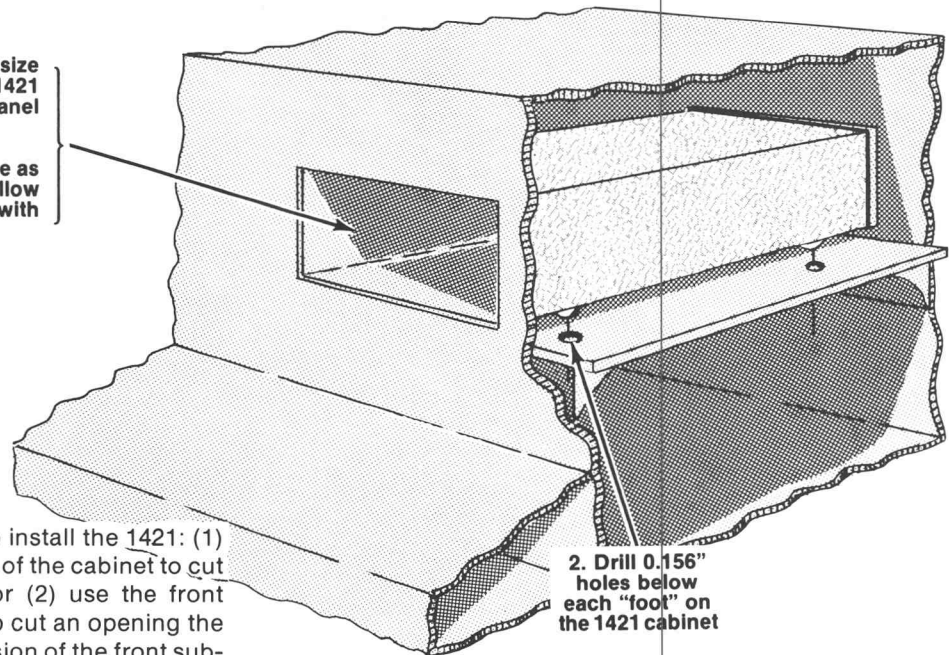
The metal cabinet (PN 437-0100-00) for the 1421 provides the proper electrical environment for the instrument, minimizes handling damage and reduces dust collection within the instrument. The four 0.156-inch diameter holes in the bottom of the cabinet depressions provide a means for mounting the instrument solidly to a surface such as a metal shelf (rack adapter) in a cabinet rack or console.

The 1421 is designed to be cradle-mounted in a standard 19-inch rack or console side by side with a Type 528 or other instrument. The Tektronix part number for the rack adapter¹ to cradle mount the instrument is 016-0115-02. If only one 1421 is mounted on the rack adapter, a panel assembly¹ that goes around the 1421 cabinet front dimension and covers the space for the other half of the rack width can be obtained by specifying Tektronix part number 016-0116-00.

CUSTOM INSTALLATION

1. Cut hole in panel the same size as the opening in the 1421 cabinet to allow the front panel casting to cover the cut.

2. Cut the hole the same size as the 1421 front casting to allow the 1421 front panel to align with the custom panel surface.



Custom Installation

There are two possible ways to install the 1421: (1) Use the front dimensional view of the cabinet to cut an opening for the cabinet, or (2) use the front dimensional view of the 1421 to cut an opening the same size as the outside dimension of the front sub-panel casting.

The first installation method allows the 1421 front sub-panel casting to cover the opening made in the custom panel. The second installation method requires a larger opening to allow the instrument to be positioned about 1/16 inch further back on the shelf to make the 1421 front panel surface align with the custom panel surface.

To install the instrument using the first method, proceed as follows:

- Remove the two securing screws from the rear of the cabinet and slide the instrument out through the front of the cabinet.
- Cut hole in custom panel. Use the front dimensional view of the cabinet or the cabinet itself to determine size of opening.
- Slide cabinet through rear side of custom panel opening. Let cabinet protrude through the front panel about 1/8 inch. (Front sub-panel casting on the 1421 has groove to accept this amount of cabinet protrusion.)
- Mark locations where cabinet will be fastened to shelf. (The bottom dimensional view drawing shows the 0.156-inch diameter hole locations in the cabinet.) Temporarily remove cabinet; drill holes in shelf.
- Reinsert cabinet through custom panel opening. Fasten cabinet to shelf.
- Insert 1421 into front of cabinet. Secure instrument to cabinet by installing the two rear panel screws removed earlier.

2. Drill 0.156" holes below each "foot" on the 1421 cabinet

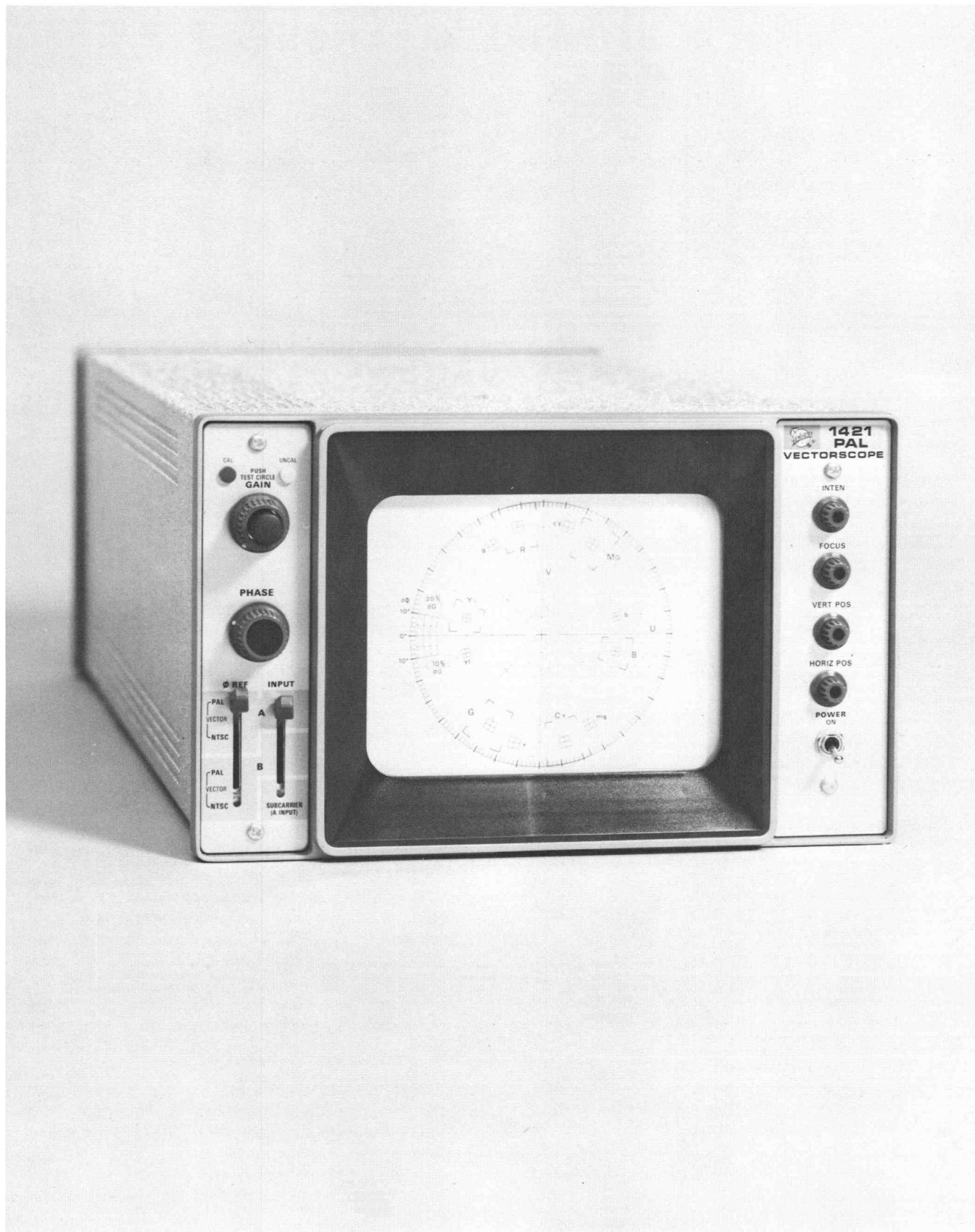
To install the instrument using the second method, the following procedure is suggested:

- Measure the distance from the front edge of the 1421 front sub-panel casting to the center of the front mounting holes in the bottom of the cabinet. (This dimension should be about 2 1/16 inches.)
- Remove the two securing screws from the rear of the cabinet and slide the instrument out through the front of the cabinet.
- Cut hole in custom panel. Use the front dimensional view of the 1421 or use rear casting on cabinet to determine size of opening.
- Mark locations of front mounting holes for cabinet. Then use cabinet to mark rear hole locations for cabinet and use dimensional drawing for guide in marking hole locations. Temporarily remove cabinet; drill holes in shelf.
- Use steps e and f of the first method as a guide for completing the installation.

Portable Usage

For portable use the 1421 can be removed from the rack or custom installation and slipped into a blue-vinyl aluminum field case.¹ The field case has a latch to hold the instrument in the case. In addition, the field case is equipped with a handle and rubber feet. Tektronix part number for the field case is 390-0018-01.

¹All items can be ordered through your local Tektronix Field Office or representative.



OPERATING INSTRUCTIONS

This section of the manual provides information intended to familiarize the user with the 1421 PAL VECTORSCOPE. Included in this section are:

1. A general description of the instrument, including major functions.
2. An explanation of the functions of the controls and connectors.
3. A check-out procedure that provides "hands-on" familiarization.
4. Instrument Specification.

NOTE

Control names that are capitalized or abbreviated on the front and rear panels of the 1421 are similarly capitalized or abbreviated in the text and illustrations.

DESCRIPTION

The 1421 is a compact (one-half rack width, 5 1/4 inches vertical height) television instrument designed to display a vector presentation of chrominance and burst. It is intended for use with PAL television systems utilizing 625 line, 50 Hz scan. An internal subcarrier regenerator will lock to 4.43361875 MHz subcarrier or burst.

Two rear panel loop-through inputs accept the signal for display or an external locking signal for the 1421 subcarrier regenerator. A front panel lever switch (ϕ REF) selects the signal from either input to be used for phase-locking the subcarrier regenerator. A second front panel lever switch (INPUT) selects the signal to be displayed on the crt and can attenuate one channel to view large signals.

The front panel GAIN control provides variation of the display size above and below unity, while the PHASE control provides continuous 360° rotation of the display.

The graticule markings provide references for burst and the colours and allow measurement of differential phase and differential gain.

Internal plug-jumpers provide easy switching to various mains voltage supplies.

CONTROLS AND CONNECTORS

GAIN	Provides variable gain control, with a calibrated detent position, of the input video signal.
PUSH (TEST CIRCLE)	Unlocks the subcarrier regenerator from the signal to which it was locked. Used to check horizontal to vertical gain match, and quadrature phasing. While the PUSH (TEST CIRCLE) button is pressed, the 180° phase switcher operates.
PHASE	Provides continuously variable, 360° uncalibrated phase control.
INPUT	Three position lever switch that selects either Channel A, Channel B, or attenuated Channel A (SUBCARRIER A INPUT) for display. The SUBCARRIER A INPUT position attenuates the signal in channel A by approximately 3 times.
ϕ REF	Four position lever switch that selects two modes of operation for either channel to phase-lock the subcarrier regenerator. One mode of operation (PAL VECTOR) displays the normal PAL signal with alternating burst and chrominance (see Fig. 1-1). The other mode (NTSC VECTOR) enables the 180° phase switcher, overlaying the -V display on the +V display (see Fig. 1-2).
INTENSITY	Controls the display brightness.
FOCUS	Controls display resolution.

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VERT position	Moves the display on the V axis.
HORIZ position	Moves the display on the U axis.
CAL Indicator	Incandescent lamp indicates that the GAIN control is in the calibrated detent position.
UNCAL Indicator	Incandescent lamp indicates that the GAIN control is not in the calibrated detent position.
A INPUT	Two rear panel bnc connectors accept external video or subcarrier signals to be displayed on Channel A or for locking the subcarrier regenerator. The inputs are loop-through and compensated for 75 Ω .
B INPUT	Two rear panel bnc connectors accept external video or subcarrier signals to be displayed on channel B or for locking the subcarrier regenerator. The inputs are loop-through and compensated for 75 Ω .
Mains Selector	Select one of two plug-jumpers, located on the Power Supply board, to alter the transformer primary configuration for 115 VAC or 230 VAC (see Fig. 1-3).
Range Selector	Three-position set of pins, located on the Power Supply board accommodates the Mains Selector and allows selection of Low, Medium, or High range. (See Fig. 1-3.) Select the range closest to the mains voltage at which the instrument will be operating.

CHECK-OUT PROCEDURE

Performance of this procedure requires a video signal generator capable of providing composite video and subcarrier signals. A Tektronix 145 was used in preparing this procedure.

1. Setup

Video Signal Generator	Set for standard PAL Colour Bar test signal; 75% amplitude, 0% setup.
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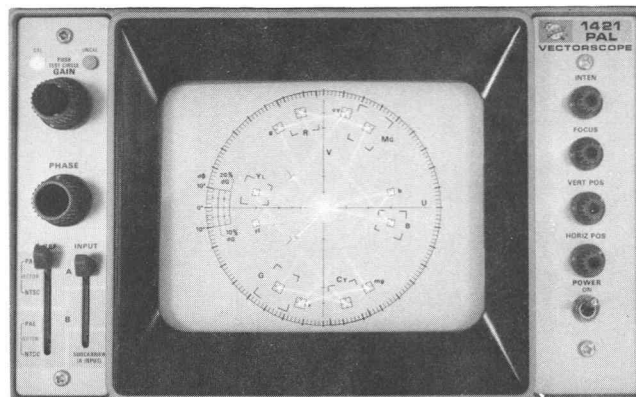


Fig. 1-1. Standard PAL colour bar display.

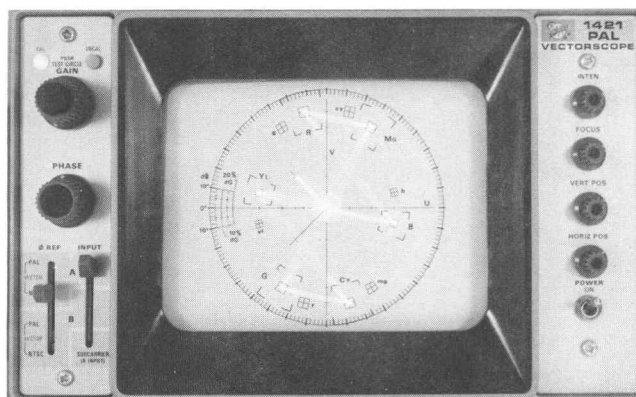


Fig. 1-2. Standard PAL colour bar, NTSC vector.

1421

GAIN	CAL
PHASE	Anywhere
ϕ REF	B VECTOR PAL
INPUT	B
INTEN	ccw
FOCUS	midrange
VERT POS	midrange
HORIZ POS	midrange
POWER	off

Connect composite video from the video signal generator to the 1421 B INPUT. Terminate the B INPUT loop-through in 75 Ω .

Connect subcarrier from the video signal generator to the 1421 A INPUT. Terminate the A INPUT loop-through in 75 Ω .

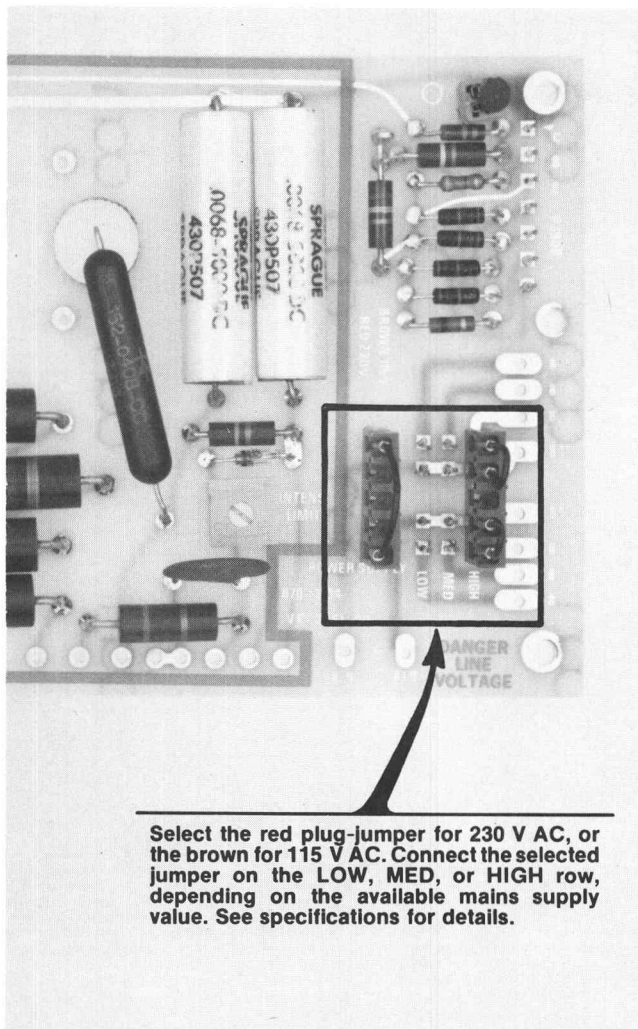


Fig. 1-3. Mains voltage and voltage range selectors.

Connect the 1421 to a suitable mains supply. Make sure that the Mains Selector plug-jumper is correctly positioned on the Range Selector pins. (See Fig. 1-3.)

Set the 1421 POWER switch on. Check that the front panel CAL lamp is lit. Allow 10 minutes warm-up before proceeding.

2. Vector Presentation of Colour Bars

Rotate the 1421 INTEN and FOCUS controls for a bright, well-defined display.

Rotate VERT POS and HORIZ POS controls to center the display origin at graticule center.

Rotate PHASE to place the burst vectors on their graticule marks. (See Fig. 1-4.)

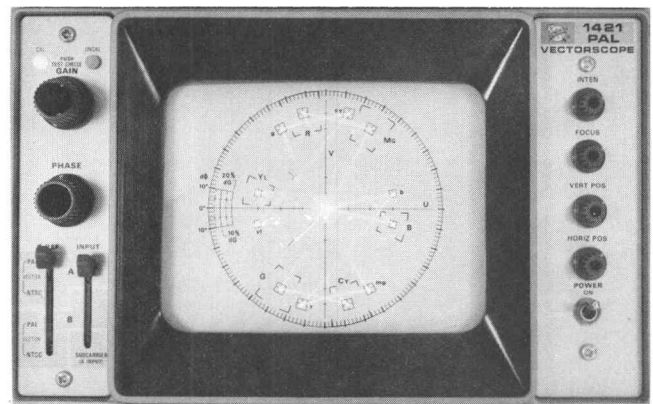


Fig. 1-4. Standard PAL colour bar display.

Each chrominance vector related to the +V burst terminates in a system of graticule markings in the shape of two boxes; a small box inside a large box. See Fig. 1-5 for an illustration of the magenta markings, used here as an example. The large box is 20° wide ($\pm 10^\circ$) centered on the magenta phase; 60.65° . The vectorial amplitude of the large box represents a total of 40%; $\pm 20\%$ of the chrominance amplitude, centered around 100% of standard amplitude, (75% amplitude, 0% setup).

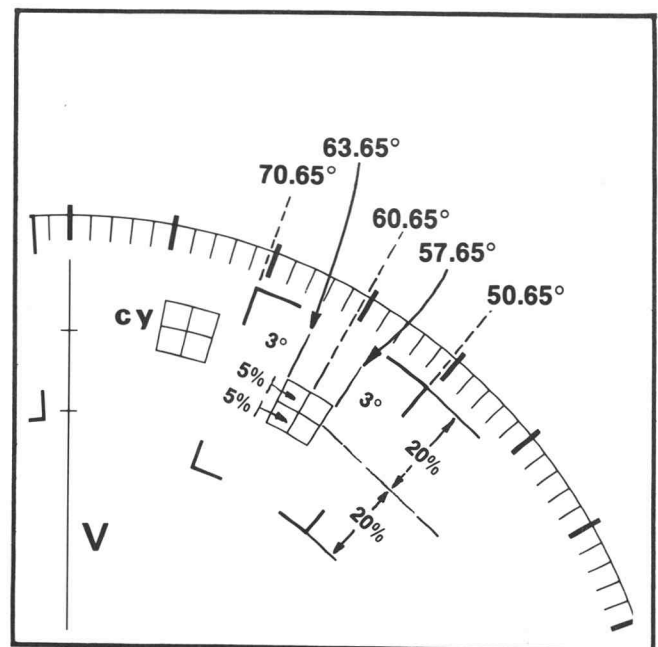


Fig. 1-5. Graticule details, Magenta box.

All large boxes associated with the +V burst represent the same dimensions, $\pm 10^\circ$, $\pm 20\%$. The small boxes all represent dimensions of $\pm 3^\circ$, $\pm 5\%$ centered on exact chrominance phase and 100% applied standard amplitude. Note that chrominance vectors associated with the +V burst are titled with capital letters: Y, C, G, M, A.

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R, B. Chrominance vectors associated with the $-V$ burst are titled in small letters: yl, cy, g, mg, r, b, and have no large boxes.

Other graticule markings could be properly discussed at this time, also. The small marks at intervals along the U and V axes denote the amplitudes of the U and V chrominance components. See Fig. 1-6a and 1-6b for illustration. The second mark on the $-U$ axis and the second mark on the $+V$ axis denote the U and V components of burst. See Fig. 1-7a and 1-7b for illustration. The combined burst components' phase and amplitude are marked along 135° and 225° as shown in Fig. 1-8.

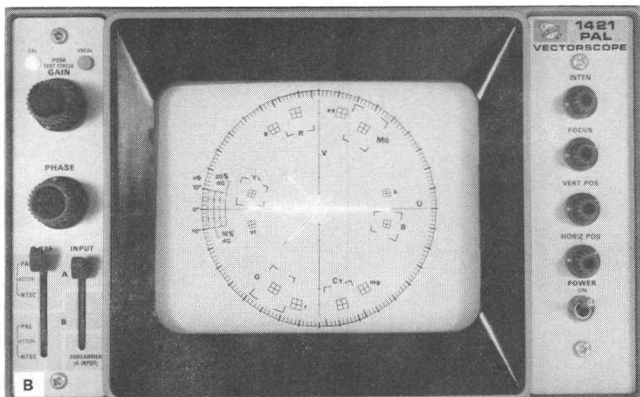
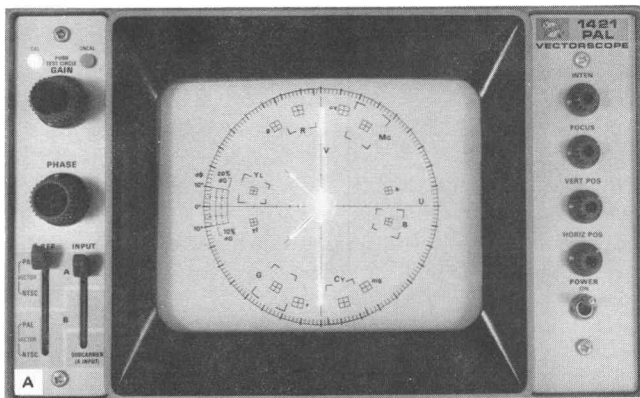


Fig. 1-6. (A) PAL colour bar, U component off, (B) PAL colour bar, V component off.

Differential gain and differential phase measurements can be made using the graticule markings located around the outer edge of the graticule at the termination of the $-U$

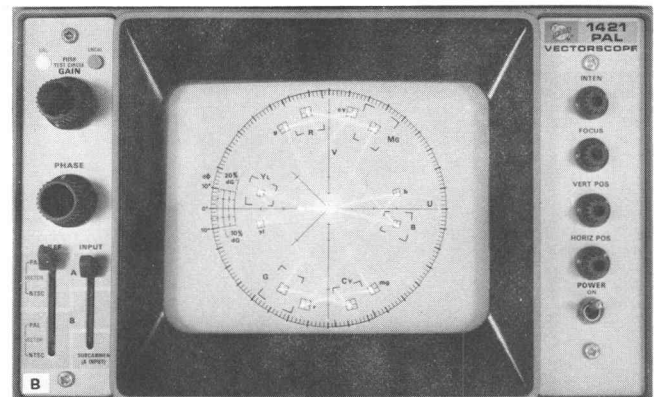
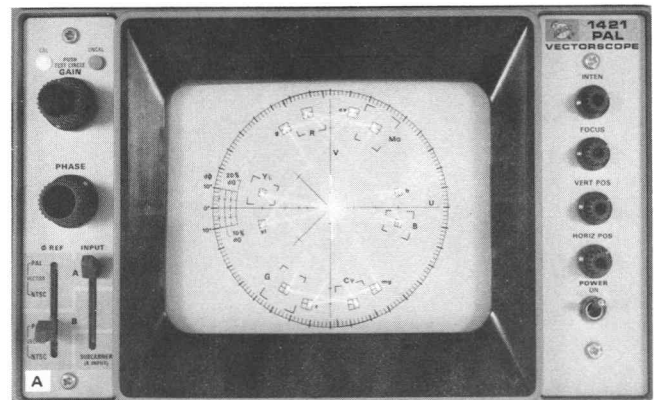


Fig. 1-7. (A) PAL colour bar, burst U component off (ϕ REF to subcarrier in opposite channel); (B) PAL colour bar, burst V component off.

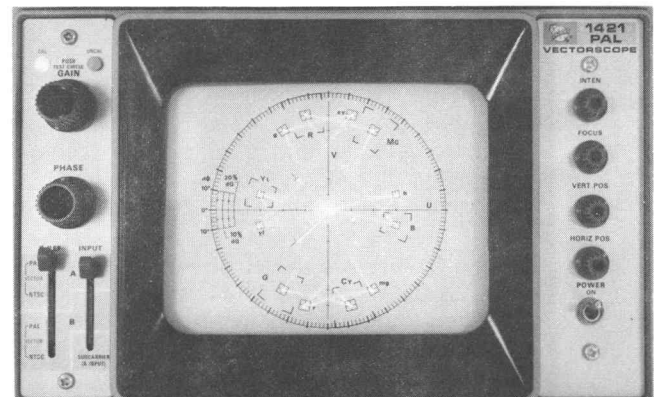


Fig. 1-8. PAL colour bar.

axis. See Fig. 1-9a and 1-9b for a differential gain measurement illustration and Fig. 1-10a and 1-10b for a differential phase measurement illustration.

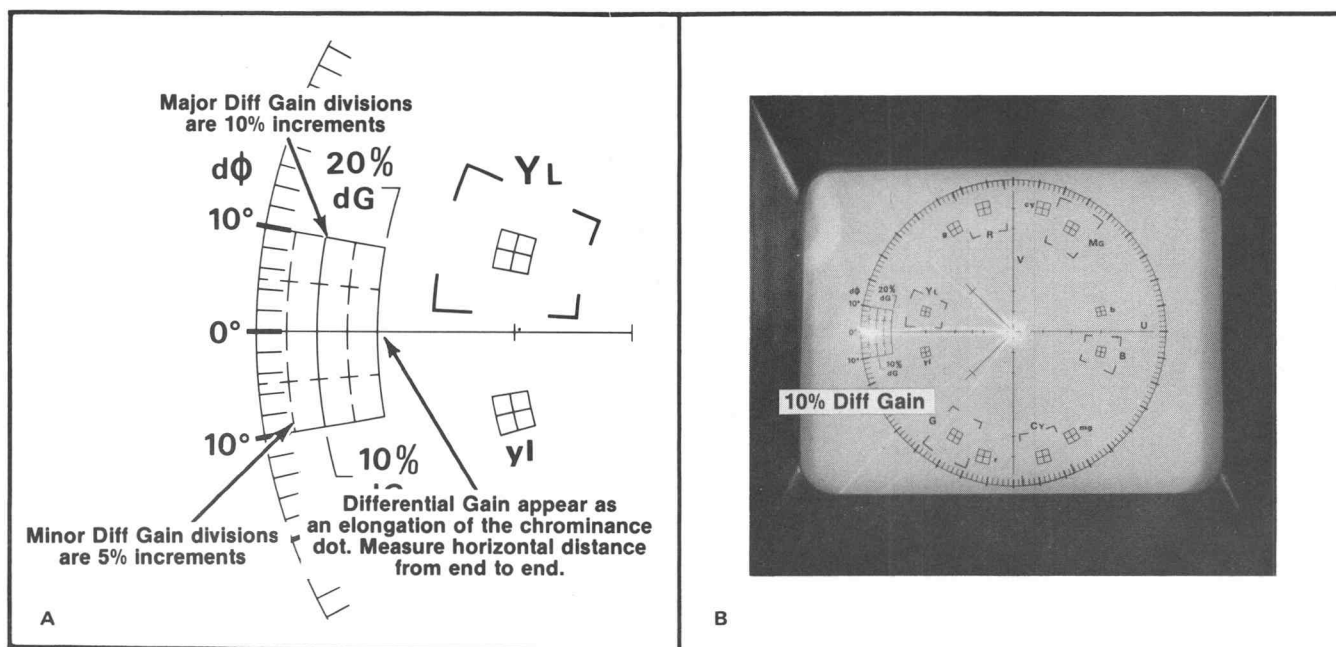


Fig. 1-9. (A) Differential gain graticule markings; (B) Example of differential gain.

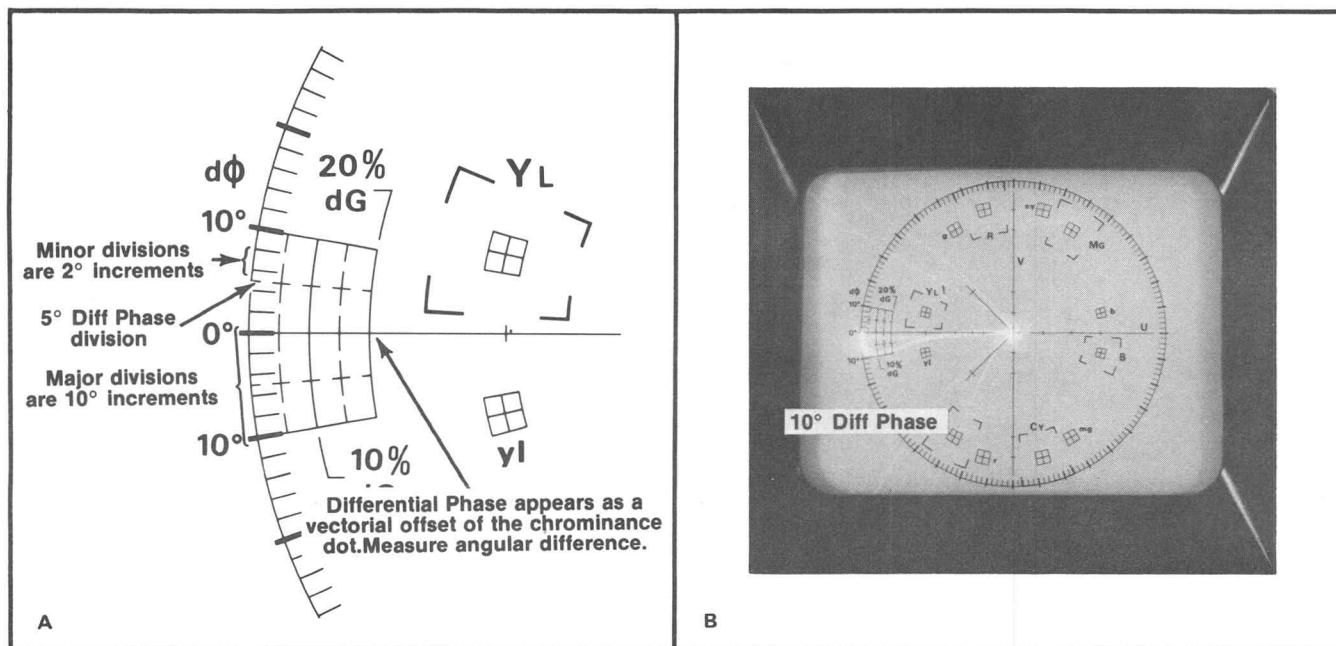


Fig. 1-10. (A) Details of Differential Phase graticule; (B) Example of differential phase.

Set the 1421 ϕ REF switch to B VECTOR NTSC. The 180° ϕ Switcher in the Demodulator is now running, causing the $-V$ burst and the chrominance vectors associated with it to be switched in phase and overlaid with the $+V$ burst and chrominance. See Fig. 1-11. This feature is particularly useful in studio source phasing.

where all input signals to the studio switcher can be displayed in turn and phase errors removed by adjusting source phasing for overlay of the 1421 display, source phasing using this feature also assumes accurate burst quadrature.

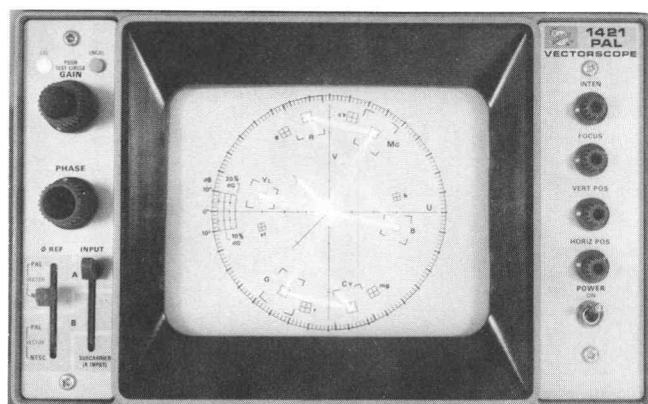


Fig. 1-11. PAL colour bar, NTSC vector.

3. Vector Presentation of Colour Bars with Phase Lock From the Opposite Channel

Set the 1421 ϕ REF switch to A VECTOR PAL. Chrominance information in channel B is now demodulated with reference to the subcarrier phase in channel A. Some phase jitter will be noticed in this mode of operation, because the Sync Stripper circuit (see Diagram 1) does not receive or regenerate composite sync. The H Regenerator (see Diagram 2) free-runs at

about 15 kHz, but not at exact line sync time. As a result, timing signals generated with reference to the H Regenerator are not exact.

4. Display of Subcarrier Signal

Set the 1421 INPUT switch to SUBCARRIER (A INPUT). Adjust the 1421 GAIN control to set the termination of the subcarrier signal on the graticule edge. Press the PUSH (TEST CIRCLE) button. This feature can be used to check vertical to horizontal gain match (see Fig. 1-12a and 1-12b) and quadrature phasing (see Fig. 1-13a and 1-13b).

Set the 1421 ϕ REF switch to B VECTOR PAL. The subcarrier phase is now demodulated with respect to burst phase in the channel B signal. See Fig. 1-14.

5. GAIN Control

Set the 1421 INPUT switch to B. Change the composite video input signal to a 5 step staircase, modulated with 140 mV of subcarrier. Rotate the 1421 GAIN control just out of the detent. The display is now about one-half original size (see Fig. 1-15) and the UNCAL indicator is lit.

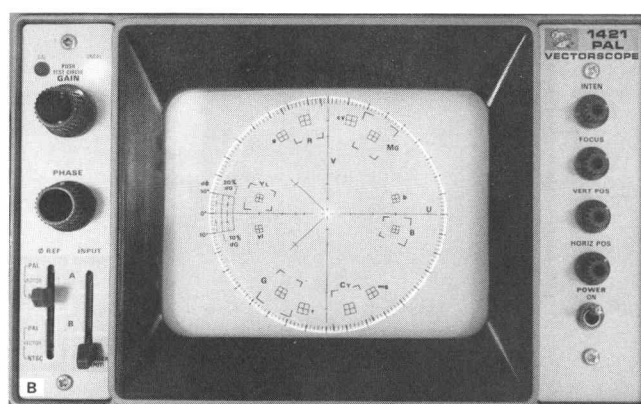
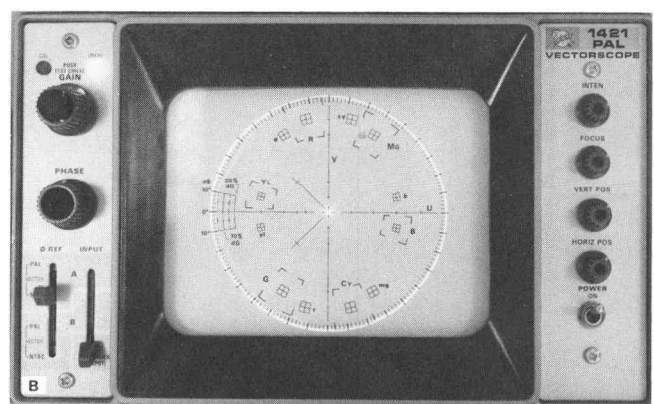
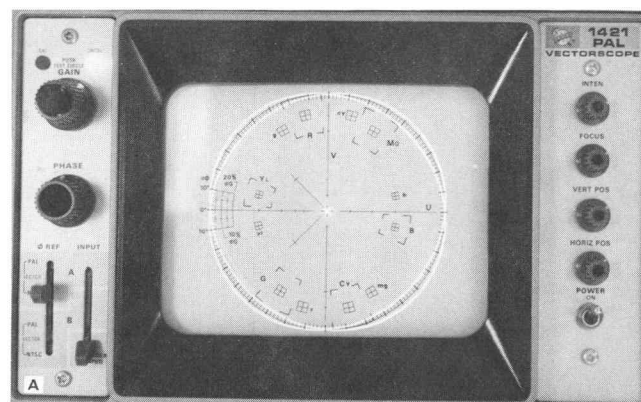
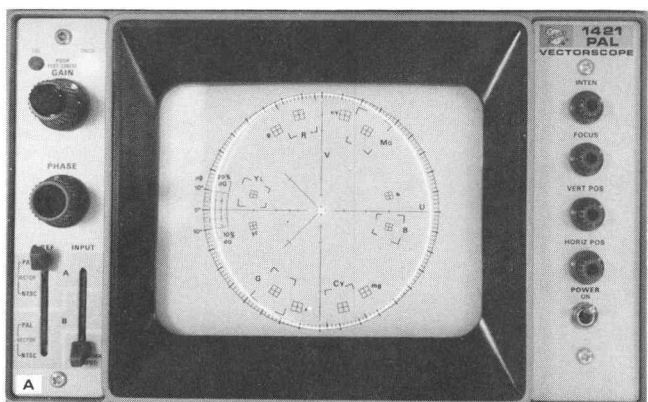


Fig. 1-12. (A) Gain match check (H gain misadjusted); (B) Gain match check (correct).

Fig. 1-13. Quadrature phase check (incorrect); (B) Quadrature phase check (correct).

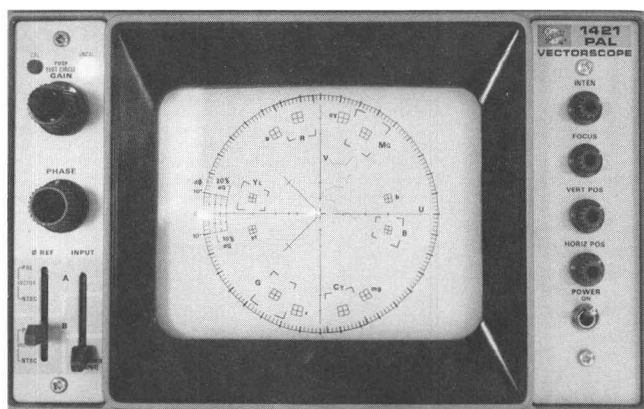


Fig. 1-14. Subcarrier signal, phase locked to colour bar burst.

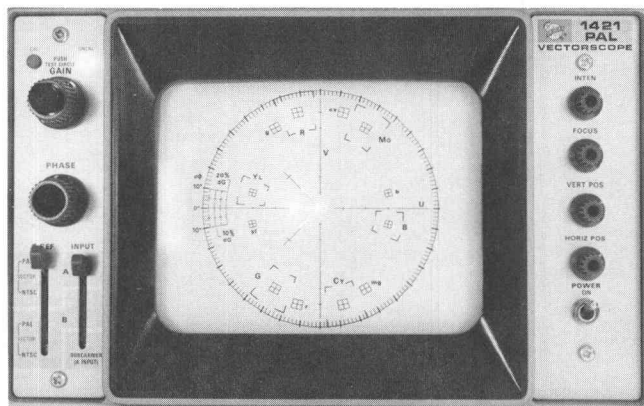


Fig. 1-15. Staircase signal, GAIN at minimum, 280 mV subcarrier.

Rotate the GAIN control to the clockwise stop. The display is now about five times original size (see Fig. 1-16). Rotate the GAIN control to the counter-clockwise detent. The display is now back to original size and the CAL indicator is lit.

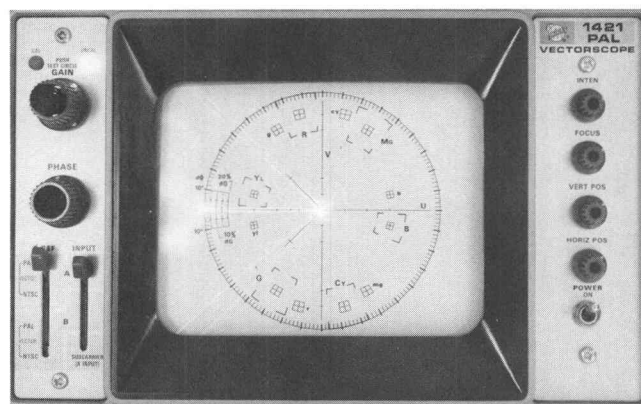


Fig. 1-16. Staircase signal, GAIN at maximum, 140 mV subcarrier.

OBTAINING DISPLAY PHOTOGRAPHS

The display photographs can be taken with a Tektronix C5 camera. The C5 is a light-weight, low-cost camera that mounts directly to the front casting of the 1421.

SPECIFICATION

The performance requirements listed here apply over an ambient temperature range of 0° to +50°C. The rated accuracies are valid when the instrument is calibrated at

+20°C to +30°C with warm-up time of ten minutes. A twenty minute warm-up is required for rated accuracies at 0° ambient temperature.

Chrominance Processing Characteristics

Characteristic	Performance Requirement	Supplemental Information
Chrominance Bandwidth Subcarrier Frequency (F_{sc}) Upper-3 dB point Lower-3 dB point	$F_{sc} + 500 \text{ kHz} \pm 100 \text{ kHz}$ $F_{sc} - 500 \text{ kHz} \pm 100 \text{ kHz}$	4.43361875 MHz
Vector Phase Accuracy	Within 1°	
Quadrature Phasing	Within 0.25°	
Subcarrier Regenerator		Phase-locked to incoming Subcarrier or burst when present. Otherwise, free-running.

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Characteristic	Performance Requirement	Supplemental Information
Pull-In Range	Within 50 Hz of 4.43361875 MHz	
Pull-In Time	Within 1 second with subcarrier frequency within 50 Hz of 4.43361875 MHz	
Phase Shift with Subcarrier Frequency Change	$\leq 0.5^\circ$ from F_{sc} to $F_{sc} + 50$ Hz, or from F_{sc} to $F_{sc} - 50$ Hz	
Phase Shift with Burst Amplitude Change	$\leq 2^\circ$ from nominal burst amplitude to +6 dB, or from nominal burst amplitude to -6 dB.	
Phase Shift with Subcarrier Source Change	$\leq 0.5^\circ$	ϕ REF switched
Phase Shift with Input Channel Change	$\leq 0.5^\circ$	Video INPUT switched
Phase Shift with Front Panel GAIN Control Change	$\leq 1^\circ$	From unity to 2 times unity, or from unity to one-half unity
PHASE Control Range		360° continuous rotation with goniometer
Burst Jitter	$\leq 0.5^\circ$	

Amplifier Characteristics

Characteristic	Performance Requirement	Supplemental Information
Input Amplitude Range	1 V \pm 6 dB	
Input DC Voltage (Max)	+20 V, -20 V	
Front Panel GAIN	Unity +15.12 dB, -6 dB	Unity to 5.7X unity, and Unity 0.5X unity.
Gain Stability		
With Temperature change	$\leq 0.5\%$, 25°C \pm 25°C	
With Mains Voltage change	$\leq 2\%$, mains voltage changed + or -10% from center of range	Range selectable by internal plug-jumpers
Position Control Range		
HORIZ	+ and -1/4 inch from center, min.	
VERT	+ and -1/4 inch from center, min.	
Clamp Stability	Spot centered within 1/8 inch	With position controls at electrical center

Characteristic	Performance Requirement	Supplemental Information
Center spot movement with rotation of PHASE control	$\leq 1/64$ inch	
Input Isolation	≥ 80 dB between channels	At F_{sc}
Input Return Loss	≥ 46 dB down, 50 Hz to 5 MHz	Loop-through terminated in 75 Ω . Input in use or not in use, instrument on or off.
Diff Phase	$\leq 1^\circ$	
Diff Gain	$\leq 1\%$	

Power Supply Characteristics

Characteristic	Performance Requirement	Supplemental Information
Power Supplies Accuracy		
+15 V		$\pm 2\%$ (± 0.3 V) +14.7 V to +15.3 V
-15 V		$\pm 1\%$ (± 0.15 V) -14.85 V to -15.15 V
+210 V		$\pm 10\%$ (± 21.0 V) +189.0 V to +231.0 V
-3500 V		approximate
Ripple		
+15 V		≤ 10 mV
-15 V		≤ 10 mV
+210 V		≤ 1 V
Mains Voltage Range		Mains Voltage is selectable by internal plug-jumper
110 VAC		
Low	90 VAC to 110 VAC (100 VAC Nominal)	
Med	99 VAC to 121 VAC (110 VAC Nominal)	
Hi	108 VAC to 132 VAC (120 VAC Nominal)	
230 VAC		
Low	180 VAC to 220 VAC (200 VAC Nominal)	
Med	198 VAC to 242 VAC (220 VAC Nominal)	
Hi	216 VAC to 264 VAC (240 VAC Nominal)	

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Characteristic	Performance Requirement	Supplemental Information
Crest Factor		at least 1.35
Fuse Data		
110 VAC	0.75 A	
220 VAC	0.5 A	
Power Consumption		30 W at 110 VAC
Max Power Consumption		38 W
Max Amps at 110 VAC, 60 Hz		0.346 A
Mains Frequency		48 Hz to 66 Hz

Environmental Characteristics

Characteristics	Performance Requirement	Supplemental Information
Temperature		
Non-Operating	−40° C to +65° C	
Operating	0° C to +50° C	
Altitude		
Non-Operating	to 50,000 feet	
Operating	to 15,000 feet	

Physical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Length	18.5 inches	46.99 cm
Width	8.5 inches	21.59 cm
Height	5.25 inches	13.34 cm
Weight	In cabinet, 15 lb Less cabinet, 13 lb, 5 oz.	6.8 kg 6.0 kg

CIRCUIT DESCRIPTION

DIAGRAM 1

INPUT PROCESSING

Input Amplifier

Q1032, Q1034, and Q1036 form a non-inverting operational amplifier with a gain of one. The Channel A signal drives the gate of Q1032. The output is the emitter of Q1036.

The output drives a switching network consisting of Q1110-CR1110, Q1120-CR1122, Q1140-CR1148. This network routes the input signal, according to the position of the INPUT switch.

If the INPUT switch is in the A position, the base of Q1110 is grounded, allowing the Channel A signal to pass through the filter and gain cell to the output amplifier. Q1120 is saturated, grounding the signals at its collector. The time constant of C1120-R1020 allows only chrominance to pass.

Q1082, Q1084, and Q1086 form a non-inverting, unity gain operational amplifier for the Channel B signal. This amplifier is identical to the Channel A input amplifier and drives a switching network consisting of Q1160-CR1164 and Q1180-CR1186.

If the INPUT switch is in the B position, the base of Q1160 is grounded, allowing the Channel B signal to pass through the filter and gain cell to the output amplifier. The other switching transistors (Q1110, Q1120) are saturated, grounding the signals at their collectors. The time constant of R1062-C1160 allows only chrominance to pass.

Switching

Signal routing through the switching network is also controlled by the ϕ REF switch, which grounds the base of Q1140 in the A position and the base of Q1180 in the B position. The result is: in the ϕ REF A position the signal incoming on Channel A drives the sync and timing circuits, while in the ϕ REF B position the signal incoming on Channel B drives the sync and timing circuits.

The operating modes for the signal switching circuit are as follows:

Mode 1. A displayed, A sync

Mode 2. A displayed, B sync

Mode 3. B displayed, A sync

Mode 4. B displayed, B sync

Mode 5. Subcarrier, A sync

Mode 6. Subcarrier, B sync

Mode 1. With INPUT A and ϕ REF A selected, the bases of Q1110 and Q1140 are grounded, allowing the chroma signal at the collector of Q1110 and the Channel A signal at the collector of Q1140 to pass undisturbed. The Channel A signal provides display and sync. The bases of Q1120, Q1160, and Q1180 are pulled positive, causing those transistors to saturate, and grounding the signals at their collectors.

Mode 2. INPUT A and ϕ REF B are selected. The bases of Q1110 and Q1180 are grounded, allowing the Channel A chroma signal to pass to the gain cell and output amplifier, and the Channel B signal to pass to the sync and timing circuits. The bases of Q1120, Q1140, and Q1160 are pulled positive, causing them to saturate, and ground the signals at their collectors.

Mode 3. INPUT B and ϕ REF A are selected. The bases of Q1140 and Q1160 are grounded, allowing the Channel B chroma signal to pass to the gain cell and output amplifier, and the Channel A signal to pass to the sync and timing circuits. The bases of Q1110, Q1120, and Q1180 are pulled positive, grounding the signals at their collectors.

Circuit Description—1421

Mode 4. INPUT B and ϕ REF B are selected. The bases of Q1160 and Q1180 are grounded, allowing the Channel B Chroma signal to pass to the gain cell and output amplifier and to the sync and timing circuits. The bases of Q1110, Q1120, and Q1140 are pulled positive, grounding the signals at their collectors.

Mode 5. SUBCARRIER (A INPUT) and ϕ REF A are selected. The bases of Q1120 and Q1140 are grounded, allowing the Channel A chroma signal at the collector of Q1120 reduced in amplitude, to pass to the gain cell and output amplifier and the Channel A signal at the collector of Q1140 to drive the sync and timing circuits. The bases of Q1140, Q1160, and Q1180 are pulled positive, grounding the signals at their collectors.

Mode 6. SUBCARRIER (A INPUT) and ϕ REF B are selected. The bases of Q1120 and Q1180 are grounded, allowing the Channel A chroma signal, reduced in amplitude, to pass to the gain cell and output amplifier, and the Channel B signal to drive the sync and timing circuits. The bases of Q1110, Q1140, and Q1160 are pulled positive, grounding the signals at their collectors.

Gain Cell and Control

Gain Cell. The chroma signal from the signal switching network drives phase match adjust, L1118 and L1178, and Q1201, a buffer amplifier. The output of Q1201 drives a gain cell composed of CR1304, C1303, and CR1401.

The signal current available for the amplifier is determined by the relative conduction of these two diodes. CR1304 has a fixed current of 0.6 mA. The current in CR1401 is variable from the gain control circuit. If CR1401 is conducting heavily, more signal current is shunted to ground, than passes through to the amplifier, and the amplifier gain is relatively low. If CR1401 is not conducting heavily, more signal current passes through to the amplifier, and the amplifier gain is relatively high.

Gain Control. The current source for CR1401, with the front panel GAIN control in the CAL position is Q1502. Q1512 is biased on by its fixed base bias to ground and its emitter return to +15 V through R1507. Q1502 is saturated and CR1413 is reverse biased. The internal Cal Adj, R1403, determines the amount of current available for CR1401.

When the front panel GAIN control is in the variable position, CR1413 is turned on and Q1512 is turned off by the -15 V applied through the Var Gain control, R222 and

R1503. Q1502 is turned off by the lack of current through Q1512. CR1413 then becomes the current source for CR1401, with the current set by the front panel GAIN control.

Lamp Switch. Q1801 is normally off the front panel GAIN switch ground providing a current source for the front panel CAL lamp. When the GAIN control is switched out of detent, the base of Q1802 is biased on by current through the CAL lamp. Q1801 becomes the current source for the front panel UNCAL lamp.

Demodulator Driver

Q1318, Q1410, and Q1412 form an inverting operational amplifier in a transresistance amplifier configuration. In a transresistance amplifier, the output voltage is directly proportional to the input current.

The input current to the amplifier is composed of fixed bias current through R1305 and CR1304, and the signal current. More or less signal current can be shunted away from the amplifier by the gain cell diode CR1401, as discussed previously.

The output voltage at the emitter of Q1412 is determined by the instantaneous input current times R1415, the feedback resistor. The output of the Demodulator Driver drives the signal inputs of the two demodulators on Diagram 3.

Sync Stripper

The Sync Stripper receives composite video and "strips" and regenerates the sync pulses. Sync pulse regeneration removes sync tip tilt and 50 Hz hum and also provides a constant amplitude sync pulse output because of the automatic gain control feature of the circuit. See Fig. 2-1 for a block diagram of the Sync Stripper.

Composite video from the Video Switching network drives the Sync Stripper input amplifier through R1276, to the emitter of Q1372.

The Sync Stripper input amplifier is an inverting operational amplifier composed of Q1372, Q1253, and Q1364. Q1253 inverts the input signal and drives summing amplifier, Q1222. The feedback loop around Q1372 and Q1253 is a low-pass filter (C1364 and Q1364) that provides negative feedback to 50 Hz signals, effectively reducing 50 Hz hum.

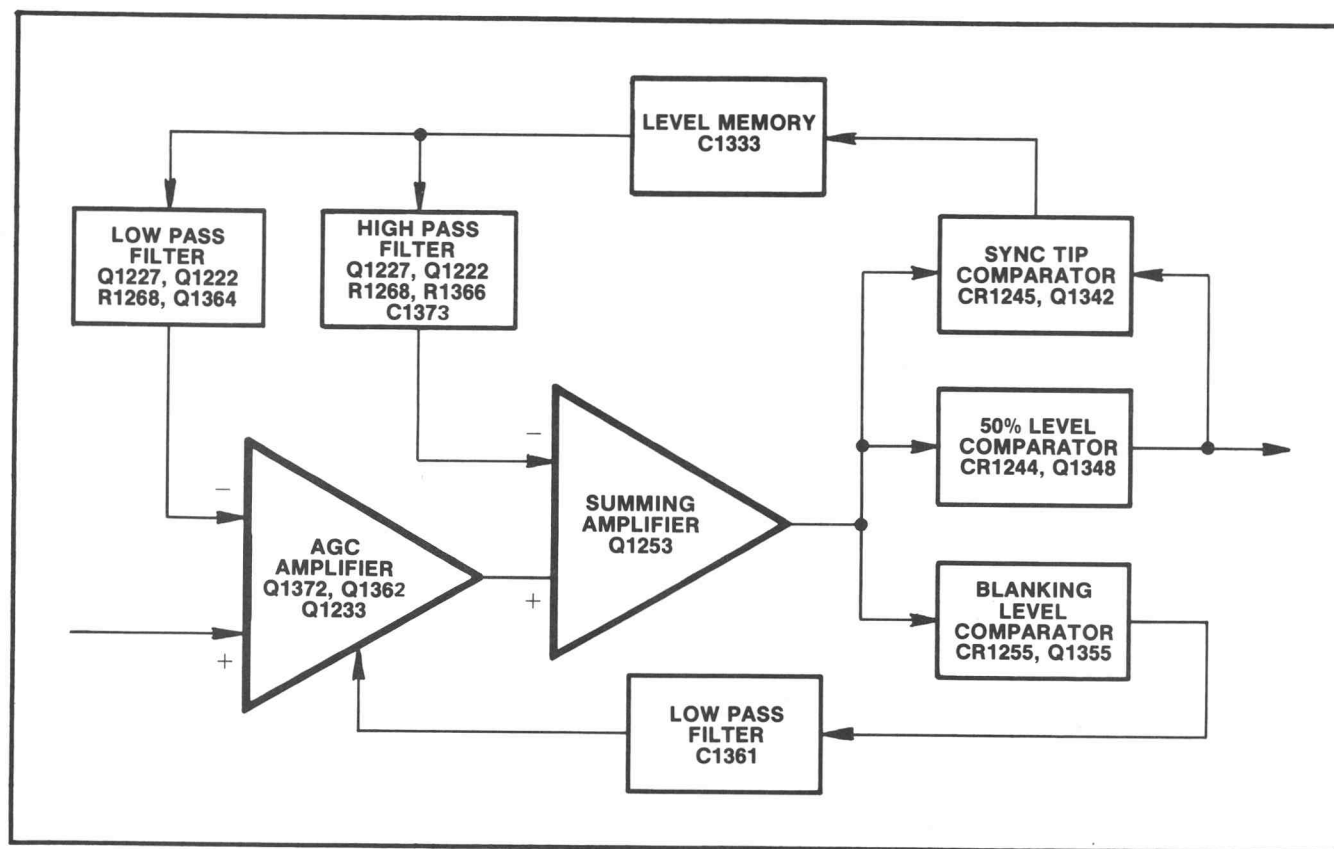


Fig. 2-1. Sync Stripper block diagram.

R1366 and C1373 form a high-pass filter that changes the gain of the summing amplifier from 1 at very low frequencies to 3 above approximately 200 Hz. This allows faster recovery of the sync tip level.

The summing amplifier, Q1222, drives emitter follower, Q1233, with inverted video (sync positive). Q1233 drives three comparators: Blanking Level, CR1255-Q1355; Sync 50% Level CR1244-Q1348; and Sync Tip, CR1235-Q1342. During active video time, the diodes in the three comparators are conducting.

When the positive-going sync pulse at the emitter of Q1233 rises past the anode of CR1235, the Sync Tip comparator switches, clamping the sync pulse tip at that point. Collector current in Q1342 charges the sync tip level memory capacitor C1333. The stored charge on C1333 is applied through emitter follower Q1227, to the summing amplifier, Q1222, which demands more or less current from the input amplifier, setting the sync tip level at the

emitter of Q1233. The Sync Tip comparator is rate-limited by C1333 so that impulses will not shift the sync tip level.

Any sync tip tilt present on the incoming video is eliminated as soon as the sync tip comparator switches, because the sync regeneration that takes place at the collector of Q1345 is isolated from the incoming video by the comparator.

CR1335 provides some current during sync time, allowing C1333 to slew negative if the sync tip is not far enough positive to turn CR1235 off.

The Sync 50% Level comparator switches at the half-amplitude point of the sync pulse at the emitter of Q1233. Collector current in Q1348 saturates Q1345, producing a 10 V pulse at the collector of Q1345 of the same width and polarity as incoming sync. This stripped sync pulse is decreased in amplitude through divider R1315 and R1312, and coupled to the base of Q1332, the input to a Bowes oscillator. The pulse also gates CR1335 on, providing current to the sync tip comparator during sync time.

Circuit Description—1421

The Blanking level comparator is biased to switch about halfway between the setup level and the blanking level. This comparator provides gain drive for the total circuit, determined by the length of time it charges C1361.

The charge on C1361 sets the bias on the base of Q1362, the AGC control. Q1362 carries part of the collector current for Q1372—the other part of this current is base current for Q1253.

If the input signal amplitude to the sync stripper is low, the blanking level comparator switches at a point closer to setup than to blanking. As a result, Q1335 conducts for a longer period of time than it would if the input were correct. The longer period of conduction charges C1361 more positive, decreasing current through Q1362. This forces more base current in Q1253, increasing circuit gain. If the input signal amplitude is high, the opposite condition prevails.

The collector of Q1345 (output of the Sync Stripper) drives the base of Q1332, the input to an emitter-coupled oscillator on Diagram 2.

DIAGRAM 2

PHASE LOCK & TIMING

H Regenerator

Q1332 and Q1432 form a Bowes oscillator that regenerates horizontal rate sync, locking out any twice-horizontal-rate signals such as vertical serrations and equalizing pulses. Output pulse width is determined by R1346 and C1346, while time between pulses is determined by R1339 and C1346. The output signal is a 5 V negative-going H-rate pulse with the pulse tip near 0 V.

The H Regenerator oscillator free-runs, if the input signal is non-composite, to provide the necessary clamping signals.

The H Regenerator output is applied through emitter follower Q1433 to the Sync Tip Clamp Generator, the Sampling Gate Generator, and the Burst Sampling timing circuits, and as a clock to the 180 degree phase switcher in the Demodulators on Diagram 3.

Sync Tip Clamp Generator

The H Regenerator signal drives the base of Q1865, which inverts and amplifies the signal and applies it to the

base of Q1739, the Demodulator Input Clamp on Diagram 3. The output of the Sync Tip Clamp Generator is a positive-going horizontal-rate pulse of about 10 volts amplitude, with the pulse tip at about +5 volts. The negative excursion of the signal is caught at -5 volts by the reverse breakdown of the base-emitter junction of Q1739 on Diagram 3.

Sampling Gate Generator

Q1963 is turned on by the output of the H Regenerator, but the leading edge of the drive pulse is delayed by R1974 and C1970. This delay causes the signal at the collector of Q1963 to start negative about 1.5 μ s after the emitter signal starts negative.

The collector of Q1963 drives the base of Q1973, turning Q1973 off. The base of Q1973 rises to turn-on potential after a time determined by R1977-C1972.

The output of the Sampling Gate Generator is a positive-going 2.4 μ s gate-pulse that provides 1 mA of amplifier bias current to each of the Demodulator Output Amplifier Clamps. The clamps sample at the time of this gate (approximately the center of line sync).

Burst Sampling Timing

When the negative-going H Regenerator output signal arrives at the base of Q1595, it is delayed about 0.5 μ s by R1588-C1592. The delayed pulse is inverted and amplified by Q1595, and applied through C1571 to the base of Q1570.

The slowly rising leading edge of the signal has no effect on Q1570, since it is normally on. The trailing edge, however, turns Q1570 off. Because of the delay at the base of Q1595, Q1570 is turned off slightly after the trailing edge of line sync. Q1570 turns on after a period of time determined by R1565-C1571, providing a positive-going pulse during burst time. This pulse, during burst time, is applied to the Phase Detector as the Burst Sample Gate.

Chroma Amplifier

Q1397 and Q1398 form an operational amplifier that is driven by the chrominance portion of the input signal through high-pass filter L1290-C1395.

The output of the Chroma Amplifier is the resultant of the bias current through R1390, modulated by signal current through the high pass filter, across feedback resistor, R1389. This amplified chrominance is applied through C1482 to the input of the Limiter Amplifier, Q1472 A and B.

Limiter Amplifier

Q1472 A and B form a non-inverting emitter coupled amplifier with gain limited to 4 mA across the parallel combination R1387-R1473. The output is four volts peak-to-peak chrominance that is coupled through two emitter followers (Q1359 and Q1462) to the Phase Detector transformer, T1465.

Phase Detector

Chrominance from the Limiter Amplifier is applied to the primary of T1465. The secondary of the transformer is switched by Q1476 and Q1477 so that opposite ends of the windings are alternately grounded at a subcarrier rate. The switching signals are derived in Q1584 and Q1573. The common emitters of this switch are driven by the Burst Sampling Gate from the Burst Sampling Timing circuit. The base of Q1584 is driven by subcarrier from the Subcarrier Oscillator through emitter follower Q1579. Since Q1584 and Q1573 are enabled at the same time by the Burst Sampling Gate, the subcarrier at the base of Q1584 is emitter coupled through Q1573. The signals at the collectors of these two transistors are then 180 degrees out of phase, causing Q1476 and Q1477 to saturate at opposite polarities of the subcarrier cycle.

The center of the secondary of T1465 is the Phase Detector output. The two secondaries are phased 180 degrees apart so that on alternate subcarrier half cycles the signal at their junction will be shifted 180 degrees. At the same time the secondaries are switched, the burst being sampled also goes through 180 degrees of phase. The result, at the Phase Detector output, is full wave rectification of the burst. (See Fig. 2-2). The rectified burst is filtered by R1560 and C1564 and applied to the inputs of a band switch (U1540A) and a voltage follower (U1540B).

The charge on C1564 is retained over the entire video line because there is no discharge path for it except during burst time. The inputs to U1540 A and B are high impedance, and Q1476 and Q1477 are off except during burst time.

The second primary winding on T1465 provides reactive shielding for one of the secondary windings. The transformer coils are wound with primary windings on the outside and the two secondary windings on the inside. The second primary winding is 180 degrees from the first primary, and physically located next to the like-phased secondary. This configuration eliminates the need for phase compensation at the input to the Error Amplifier.

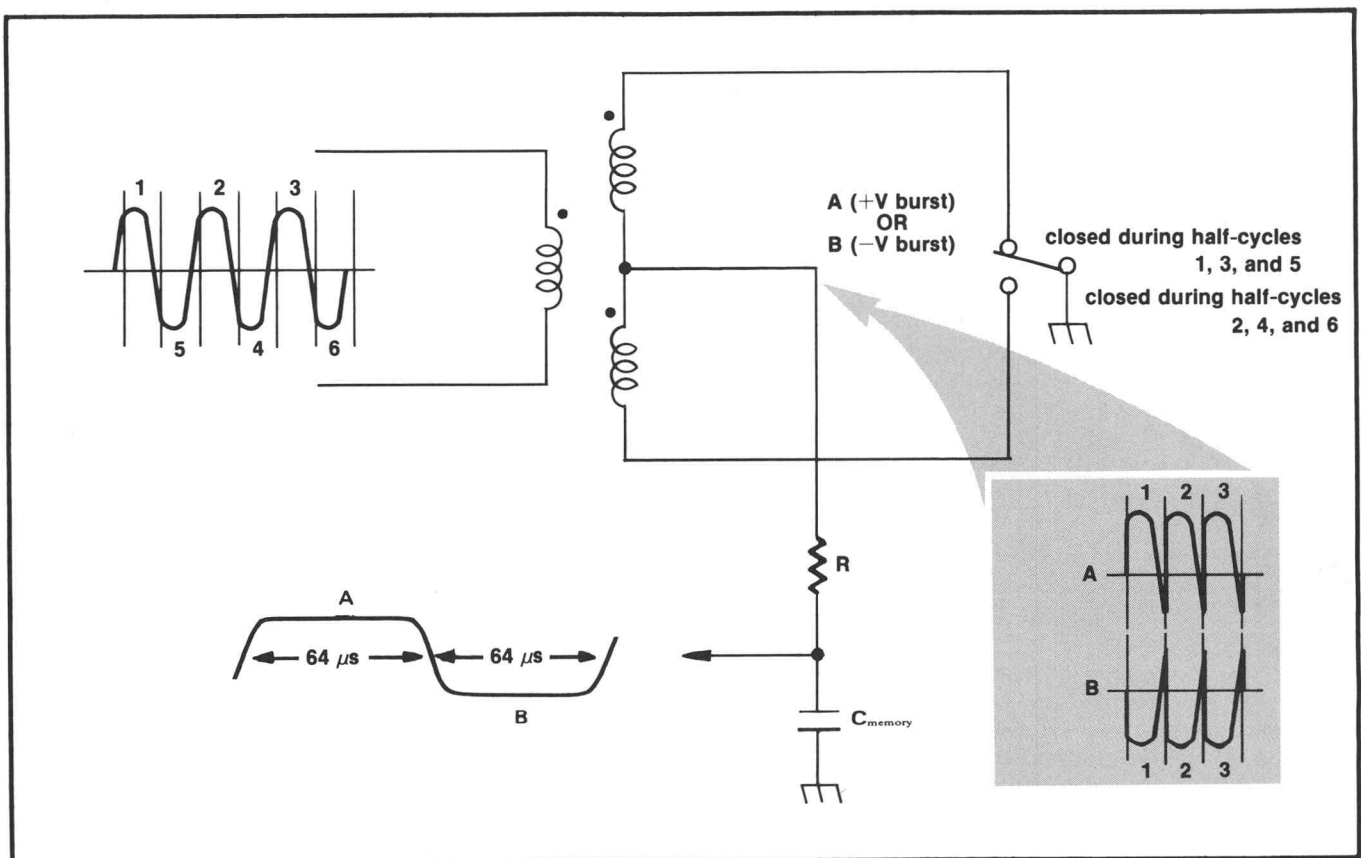


Fig. 2-2. Simplified diagram of Phase Detector operation.

Error Amplifier

U1540 B (a voltage follower), U1540A and Q1543 (a band switch), and U1548 (an inverting amplifier) form the Error Amplifier circuit.

The output of the Phase Detector drives U1540B pin 5. Since U1540B is connected as a voltage follower, a signal identical to the input signal drives the PAL Preset circuit on Diagram 3 and U1548's input resistor, R1551.

The band switch is a non-inverting operational amplifier, (U1540A) with the negative input biased slightly positive. If the error signal across C1564 exceeds the fixed bias at U1540A pin 2, the output (pin 1) becomes 24 V peak-to-peak square waves at the error signal rate. The square waves are positive-peak detected by CR1552 and averaged by C1553, saturating Q1543. With Q1543 saturated, the input resistance to U1548 is R1553 in parallel with R1551, increasing the gain of U1548 and increasing the rate at which the bias on the Subcarrier Oscillator varicap changes. This allows rapid lock of the Subcarrier Oscillator to the burst. Once lock is accomplished, the output of U1540A goes negative, turning off Q1543, switching the band switch to narrow band. The narrow band state of the band switch makes the Error Amplifier immune to noise.

U1548 is an inverting operational amplifier, slew-rate limited by C1555 and R1555 in the feedback loop.

U1548's positive input is referenced to a variable resistive divider, allowing R1561 (Balance) to set the level at U1548 pin 3 from 0 V to +0.15 V. The Balance control is adjusted for minimum phase shift should burst amplitude vary.

Pin 1 of P1699 goes to -15 V when the front panel PUSH (TEST CIRCLE) button is pressed. The Error Amplifier output is then about -12 V, reducing the bias on the Subcarrier Oscillator varicap, and raising the oscillator frequency by 100 Hz (adjustable by R1562).

The Error Amplifier output is taken from U1548 pin 6, and applied to the Subcarrier Oscillator.

Subcarrier Oscillator

Y1670 and Q1680 form a crystal-controlled oscillator, operating about class A, with fine tuning of the oscillator frequency done by varicap CR1663. Oscillation is sustained by the negative-resistance characteristic of the emitter to base junction of Q1680, in conjunction with the parallel combination of the reactances of C1685 and C1690. (See Fig. 2-3.) As long as this negative-resistance

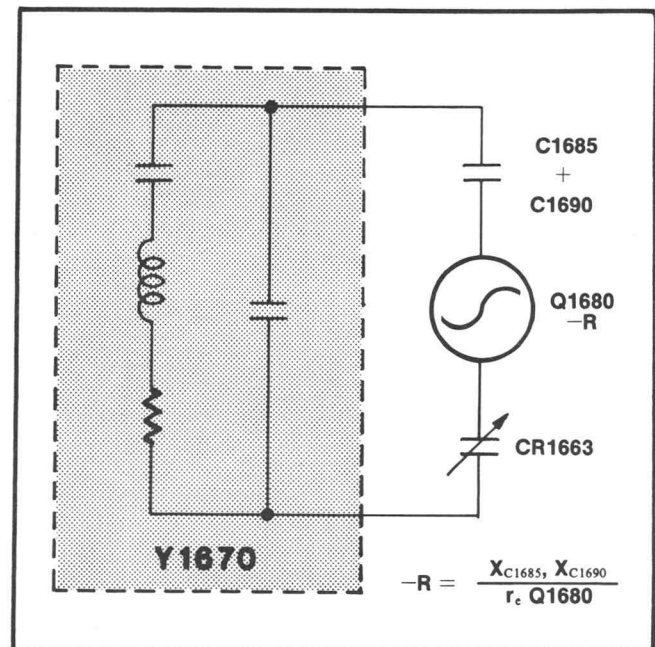


Fig. 2-3. Equivalent Subcarrier Oscillator circuit.

characteristic is adequate to overcome losses in the bulk resistance of the crystal, oscillations can continue. The negative-resistance can be adjusted by selecting the proper emitter resistor for Q1680. The ratio of C1690 to C1685 is important in providing adequate signal current out of the oscillator. The ratio of crystal current to signal current is roughly equivalent to the ratio of C1685 to C1690.

R1554 and R1652 limit the range of frequency control of CR1663. R1554 is adjusted for 100 Hz below subcarrier frequency and R1652 is adjusted for 100 Hz above subcarrier frequency.

Q1680's collector load is the front panel PHASE control. The output of the PHASE control drives amplifier Q1782, which provides subcarrier signal to the U and V Demodulators on Diagram 3. The output of Q1782 also drives peak detector CR1671 which supplies bias to AGC amplifier Q1781. The conduction of Q1781 varies the bias on oscillator transistor Q1680 to maintain a nearly constant amplitude at the output of the PHASE control.

The subcarrier signal from Q1680 is also applied to the Phase Detector circuit, through emitter follower Q1579.

+5 V Supply

VR1986 generates +5.6 V, which is filtered by C1990 and applied through emitter follower Q1995 to the points in the circuit requiring +5 V.

DIAGRAM 3**DEMODULATOR AND DEFLECTION AMPLIFIER**

Circuits on this Diagram accept chrominance signals from the Gain Cell on Diagram 1, demodulate them with reference to the internally regenerated subcarrier and apply the resultant signals to the Deflection Amplifier.

180° Phase Switcher

U1614 drives two clamps—one on each of the opposite-polarity carrier inputs of the V demodulator—to cause demodulation alternating 180° on successive lines. Switching takes place only if the front panel ϕ REF switch is in an NTSC position, or if the front panel PUSH (TEST CIRCLE) button is pressed. In ϕ REF PAL position, with the PUSH (TEST CIRCLE) switch closed (normal position), the preset input of U1614 is at ground, causing pin 5 (1 output) to be high. With U1614 pin 5 high, Q1605 is saturated and U1715 pin 7 (+ carrier input) is driven by the reference subcarrier.

With the ϕ REF switch in NTSC positions, U1614 pin 3 is clocked at a line rate by positive going pulses from the H Regnerator circuit on Diagram 2. The leading edge of these pulses are coincident with the leading edge of line sync. Placing the ϕ REF switch in NTSC positions allows the PAL Preset circuit to drive U1614's preset input. The PAL Preset output is derived from the Phase Detector circuit, and ensures that the + carrier input of the V demodulator is driven by the reference subcarrier on +V lines.

PAL Preset

The base of Q1531 is driven by the Phase Detector error signal from U1540B pins 6 and 7. Q1531's emitter time constant consists of C1532 combined with the R_{tr} of the transistor. With approximately 3 mA emitter current, the R_{tr} is about 8 Ω . The time constant is about 1.8 μ s, a relatively short time with respect to a video line, so Q1531's collector signal is 10 μ s pulses, alternating in polarity with each line. Q1513 inverts and amplifies the positive-going signals at its base. Positive-going signals occur every other line on +V lines.

The collector of Q1513 drives U1614 pin 4, the preset input, with negative-going pulses at about burst time on +V lines. This ensures that U1614 pin 5 will be positive and Q1605 saturated on +V lines and the V demodulator + carrier input (pin 7) will be driven by the reference subcarrier.

V Demodulator

The reference subcarrier from the Subcarrier Oscillator on Diagram 2 is applied to 90° phase shift network C1646-L1666-C1653 and from there, past the 180° Phase Switcher clamps to the + and - carrier inputs of the demodulator (U1715 pin 7 and pin 8).

The + and - signal inputs (pin 1 and pin 4) are driven by input signal chrominance from the Demodulator Driver on Diagram 1.

The output (pin 6) is a series of levels, whose amplitudes correspond to the phase difference between the reference subcarrier and signal chrominance. The V Demodulator reference subcarrier is phased on the V axis, so U portions of the signal do not affect the amplitudes of the signal output since they are 90° away from V. The demodulated chrominance passes through a low-pass filter that removes any remaining subcarrier and determines rise-time and delay to the V Deflection Amplifier Driver.

U Demodulator

U1755 receives reference subcarrier at its + carrier input (pin 7) and input signal chrominance at the + signal input (pin 1).

The reference subcarrier at U1755 has not been phase shifted, so it is phased on the U axis. The output at pin 6 is a series of levels with amplitudes corresponding to the phase relationship of input signal chrominance to U reference subcarrier.

This output signal is filtered as in the V Demodulator and applied to the U Deflection Amplifier Driver.

Sync Tip Clamp

Q1739 is driven to saturation during line sync time by a pulse from the Sync Tip Clamp Generator on Diagram 2. During the time Q1739 is saturated, any residual subcarrier present in the signal is grounded, providing a clean zero carrier reference for the demodulator circuits. When the demodulator outputs go to zero, so do the deflection amplifiers. This provides an accurate center dot on the display.

V Deflection Amplifier Driver

Q1927, Q1928, and Q1929 form an inverting operational amplifier with a voltage gain of about fifteen.

Circuit Description—1421

(R1912/R1920) The output of the amplifier is taken from the emitter of Q1929, and drives the V Deflection Amplifier.

R1837 routes a small amount of V signal current to the input of the U Deflection Amplifier Driver circuit. This current would rotate the display slightly but adjustable signal current of opposite phase is applied from R1916 (V Align). The amount of rotation then becomes adjustable providing a form of geometry control.

U Deflection Amplifier Driver

Q1933, Q1935, and Q1937 form the U Deflection Amplifier Driver. This circuit is similar in operation to the V Deflection Amplifier Driver.

R1839 routes U signal current to the input of the V Deflection Amplifier Driver and R1951 becomes a form of orthogonality control.

V Clamp

U1915 is an operational transconductance amplifier used as a "sample and hold" device. Demodulated signal chrominance drives the negative input (pin 2), while offset voltage is applied to the positive input (pin 3) from the front panel VERT position control. During the center of line sync time, a $2.4 \mu\text{s}$ pulse is applied to the amplifier bias input (pin 5), turning the device on. The level at pin 2 is transferred to the storage capacitor, C1910, during the $2.4 \mu\text{s}$ "on" time.

The stored level is applied through source follower Q1811 to the bias input (pin 5) of U1715, changing the output bias current from U1715, and changing the V Deflection Amplifier Driver output DC level.

U Clamp

U1950 is the sample and hold device, driving memory cap C1951, and Q1855. In operation, this circuit is identical to the V Clamp.

V Deflection Amplifier

Q2700 and Q2735 form a paraphase amplifier that accepts the single-ended output from the V Deflection Amplifier Driver and produces the double-ended output required to drive the vertical deflection plates.

U Deflection Amplifier

Q2775 and Q2795 form the U Deflection Amplifier. In operation, it is similar to the V Deflection Amplifier. C2890, C2891, and R2780 provide high-frequency peaking.

DIAGRAM 4

POWER SUPPLIES & CRT

Circuits on this diagram provide operating potentials for the instrument, including accelerating potential for the crt.

Power Input

The Mains voltage is applied to the primary of T430 through a choice of two plug-jumpers that can be selected for 110 VAC, 220 VAC and for low, medium and high Mains voltage ranges. (See Operating Instructions, Section 1.)

T430 has two secondaries; one for the +15 volt and -15 volt supplies, and one for the +210 volt supply.

CR3030 provides half-wave rectification for the collector supply of Q1801 on Diagram 1.

+15 Volt Supply

Q3018, Q3019, VR3020, and Q425 form the +15 Volt Supply. Q3018 is a constant current load, demanding 2 mA from the Circuit. If the current load on the circuit increases, the voltage at the base of Q3019 decreases. The constant current demanded by Q3018 is then satisfied through the base of Q425, decreasing its emitter to collector voltage drop and bringing the supply back to +15 volts.

VR3020 is the supply reference voltage for this circuit.

-15 Volt Supply

Q3080, Q3088 and Q427 form the -15 Volt Supply. In operation, this circuit is similar to the +15 Volt Supply.

+210 Volt Supply

Q3905 and Q428 form the +210 Volt Supply. The output voltage is established by the constant current in R3910 driving R3915. If the current load on the circuit increases, base current in Q3905 increases, causing the emitter of Q428 to move in the positive direction, bringing the supply back to its proper level.

High Voltage

Q430 is the High Voltage oscillator; Q3279 and Q3380 form a regulator for the supply.

Q430 oscillates at approximately 30 kHz. The principal frequency-determining components are C3350 and the inductance of the transformer.

When power is first applied, the base of Q3279 sees only the -15 V and turns on. Collector current for Q3279 saturates Q3380, providing base current for Q430 and turning Q430 on. Regenerative feedback is accomplished by inductive coupling from the collector winding to the base winding of T3510.

As the amplitude of the oscillation increases, the lower secondary winding of T3510 begins to supply positive voltage for the resistor divider on the base of Q3279. As this voltage rises toward $+200\text{ Volts}$, the current through Q3279 decreases, bringing Q3380 out of saturation. Q3380 biases Q430 so that the amplitude of oscillation is stable.

R3210 samples the DC current in the high voltage secondary of T3510 and causes the regulator to change the oscillator amplitude to maintain constant current at the crt cathode.

The output of the high voltage rectifier goes to a resistor divider that divides the voltage down for the FOCUS, INTENSITY, and Intensity Limit controls (R420, R410, and R3769 respectively).

VR3760 maintains a constant voltage between the CRT cathode and control grid, as the INTENSITY control is varied.

The third secondary winding in T3510 is the 6.3 V heater winding for the crt.

MAINTENANCE AND CALIBRATION

MAINTENANCE

The maintenance information contained in this section falls into two categories: Preventive Maintenance; Corrective Maintenance.

Preventive Maintenance includes inspection, cleaning, and semiconductor checks. Corrective Maintenance includes parts replacement, ordering information, troubleshooting techniques, and troubleshooting aids.

PREVENTIVE MAINTENANCE

A regular schedule of preventive maintenance can improve instrument reliability and can also prevent instrument breakdown. How often the preventive maintenance schedule is performed should be determined by the severity of the operating environment.

Visual Inspection

Visually inspect the instrument during the preventive maintenance routine for such defects as broken connections, loose or disconnected pin connectors, improperly seated transistors and integrated circuits, and damaged components.

The corrective procedure for most visible defects is obvious; however, care must be taken to determine and correct the cause of heat-damaged components.

Heat-damage is usually an indication of troubles elsewhere in the instrument.

Cleaning

Dirt, accumulating in the instrument, acts as an insulating blanket, preventing efficient heat dissipation, and possibly causing overheating and component breakdown. Accumulated dirt can also provide an electrical conduction path, especially under high humidity conditions.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Avoid chemicals that contain benzene, toluene, xylene, or similar solvents.

Exterior. Remove accumulated dust with a soft cloth or small paint brush. The brush is particularly useful around the front panel controls.

Remaining dirt can be removed with a soft cloth, dampened in a mild detergent and water solution. Do not use abrasive cleaners.

CRT. Clean the crt face and face shield with a soft lint-free cloth dampened in denatured alcohol.

Interior. The best way to remove accumulated dust inside the instrument is to expel it with dry, low-velocity air. Remaining dirt can be removed with a small paint brush or a soft cloth, dampened in a mild detergent and water solution. A cotton-tipped applicator is useful in tight places.

Lubrication

The reliability of potentiometers, rotary switches, and other moving parts can be maintained if they are kept properly lubricated. Use a cleaning-type lubricant on switch contacts (for example Tektronix Part Number 006-0218-00), and a heavier grease on switch detents (for example, Tektronix Part Number 006-0219-00). Lubricate non-sealed potentiometers with a lubricant that does not affect electrical characteristics (for example, Tektronix Part Number 006-0220-00). The potentiometer lubricant can also be used on shaft bushings. Do not over-lubricate.

A kit, containing the necessary lubricants and instructions may be ordered from Tektronix Inc. Order Tektronix Part Number 003-0342-00.

Transistor and Integrated Circuit Checks

Periodic transistor and integrated circuit checks are not recommended. The best performance check for these devices is actual operation in the instrument. Performance of the circuit is thoroughly checked during the performance check or calibration procedure. Any substandard transistors or integrated circuits will usually be detected at that time.

Recalibration

To ensure measurement accuracy, check instrument calibration every 1000 hours of operation or every six months, if used infrequently. Replacement of components may also necessitate recalibration of the affected circuits.

The calibration procedure can also be helpful in localizing certain troubles, or minor troubles can sometimes be revealed and corrected by recalibration.

CORRECTIVE MAINTENANCE

Information presented here includes troubleshooting aids and techniques, and component ordering and replacement information.

Troubleshooting Aids

Diagrams. Circuit diagrams are provided on foldout pages at the rear of the manual. Each component, its electrical value, and circuit numbers are shown on the diagram.

Each diagram has been assigned a diagram number and a title. For example, the first diagram has been assigned the number 1, and is titled Input Processing. The diagrams are divided into functional blocks bordered by gray lines. Notice that Diagram 1 contains blocks named A Input Amplifier, B Input Amplifier, Signal Switching, Gain Cell and Control, Demodulator Driver, Sync Stripper, and Lamp Switch. The Circuit Description in Section 2 is organized with respect to these and other blocks.

Circuit Board Illustration. Each circuit board is illustrated on the back side of the foldout page preceeding the appropriate circuit diagram. Notice that the Demodulator board is illustrated on the back of the Block Diagram foldout and opposite Diagram 1. This allows for immediate correlation between the circuit diagram and the physical location of the parts in the circuit.

Circuit numbers are assigned on a grid system. For example, notice the Demodulator board illustration, opposite Diagram 1. The upper left hand corner of this board

has been assigned numbers around 1000. Proceeding from left to right, the numbers increase toward 1100. From left to right across the bottom of the board, the numbers increase toward 1999. Using this method, the physical location of each component is readily available.

Wire Color Codes. All insulated wires used in this instrument are color-coded to aid in circuit tracing. Table 3-1 summarizes wire color codes used in this instrument.

TABLE 3-1

Color Code	Significance
Black	Chassis Ground
Yellow on Green	Safety Ground
Gray ¹	Mains Supply
White ¹	Signal
Red ²	B+
Violet ²	B-

¹Color stripes are used on these wires as an aid to circuit tracing.

²Color stripes on wire indicates position of supply with respect to 0 Volts. A black stripe on a red wire would be the first voltage in a positive direction. If a second stripe is used (white only), it indicates an unregulated supply.

Resistor Color Code. Resistors used in this instrument are standard parts. Most are composition, with some metal film types. They are color-coded with the standard EIA color code. (See Fig. 3-1.)

Capacitor Marking. The electrical value of common disc capacitors and electrolytics used in this instrument are marked in microfarads on the component body. The white ceramic capacitors are color-coded in picofarads using a modified EIA code. (See Fig. 3-1). Tantalum slug capacitors are color-coded in picofarads, using a modified EIA code with the dot indicating both voltage rating and the positive side. (See Fig. 3-2.)

Troubleshooting Techniques

Troubleshooting should proceed in a logical sequence that checks the simple possibilities before beginning detailed analysis of the circuits involved.

Check Control Settings. Incorrect control settings can set off a chase for problems that do not exist. Read the Operating Instructions section of this manual if questions arise concerning the correct function or operation of any control.

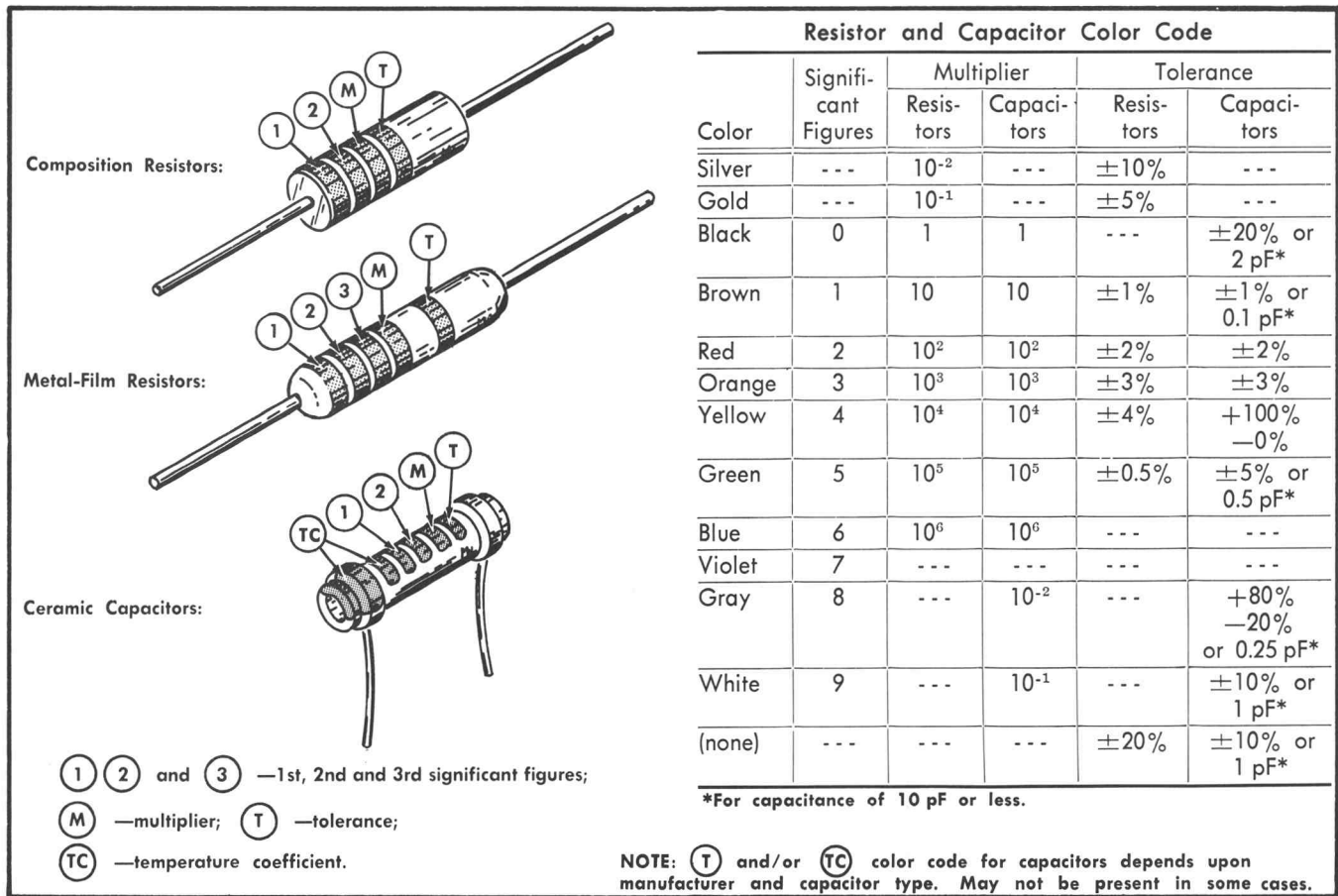


Fig. 3-1. Standard EIA colour coding for resistors and capacitors.

Check Operation of Associated Equipment. Make sure that interconnections and terminations are correct. Look for faulty cables or incorrect settings on signal source. Be positive before troubleshooting the 1421, that the 1421 is at fault.

Isolate Trouble to a Circuit. Visible symptoms can often point at the circuit at fault. For example, if there is no horizontal deflection of the display, the logical starting point is in the U Deflection Amplifier. Then work back through the circuits by taking voltage and waveform readings to find the trouble.

If the operation of all circuits is faulty, the trouble may be in the power supply. Check for correct power supply voltages. (See steps 3 through 6 of the Performance Check/Calibration Procedure in this section.) Occasionally, a defective component elsewhere in the instrument can cause a load on the power supply that looks like a power supply failure.

Visual Check. Visually inspect that portion of the instrument in which the trouble is located. Look for poor solder connections, broken wires, damage to the circuit

board, damaged components, loose pin connectors or incorrectly connected pin connectors, etc.

Pin connectors provide a convenient means of circuit isolation. For example, a short in a power supply can be isolated by disconnecting the power distribution pin connectors when making resistance to ground checks.

Check Voltages and Waveforms. Often, a defective component can be located by checking for the correct voltage or waveform in the circuit. Typical waveforms are shown in the Diagrams section. The waveforms are not absolute and may vary slightly between instruments.

CAUTION

Due to component density on circuit boards, care should be taken with meter leads and probe tips. Accidental shorts can cause abnormal voltages or transients that may destroy components. "Ground lugs" are not always at ground potential. Check the diagrams before using such connections as ground for meter prods or oscilloscope probes. Some transistor cases may be elevated.

Rated Voltage VDC 25° C	Colour	CODE FOR CAPACITANCE IN PICO FARADS		
		1st Figure	2nd Figure	Multiplier—pF
4	Black	0	0	None
6	Brown	1	1	X 10
10	Red	2	2	X 10 ²
15	Orange	3	3	X 10 ³
20	Yellow	4	4	X 10 ⁴
25	Green	5	5	X 10 ⁵
35	Blue	6	6	X 10 ⁶
50	Violet	7	7	X 10 ⁷
	Gray	8	8	
3	White	9	9	

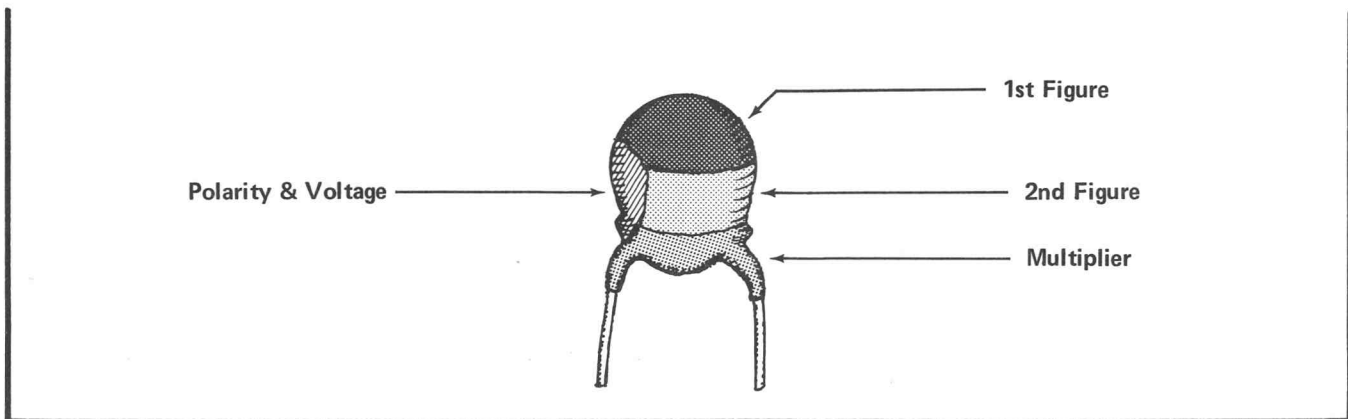


Fig. 3-2. Color coding for dipped tantalum capacitors.

Check Individual Components. Methods of checking passive components are fairly obvious. If there is any doubt about isolation of a soldered-in component, unsolder one end.

Diodes can be checked for open or shorted conditions by measuring front and back resistance between terminals. Use an ohmmeter scale with an internal source between 800 millivolts and 3 volts. Resistance should be very high in the back direction, and very low in the forward direction.

CAUTION

Do not use an ohmmeter scale that has high internal current. High current may damage the diode.

Transistor operation is best checked by performance in an operating circuit. If a transistor is suspected of being defective, substitute a new transistor. Be certain that

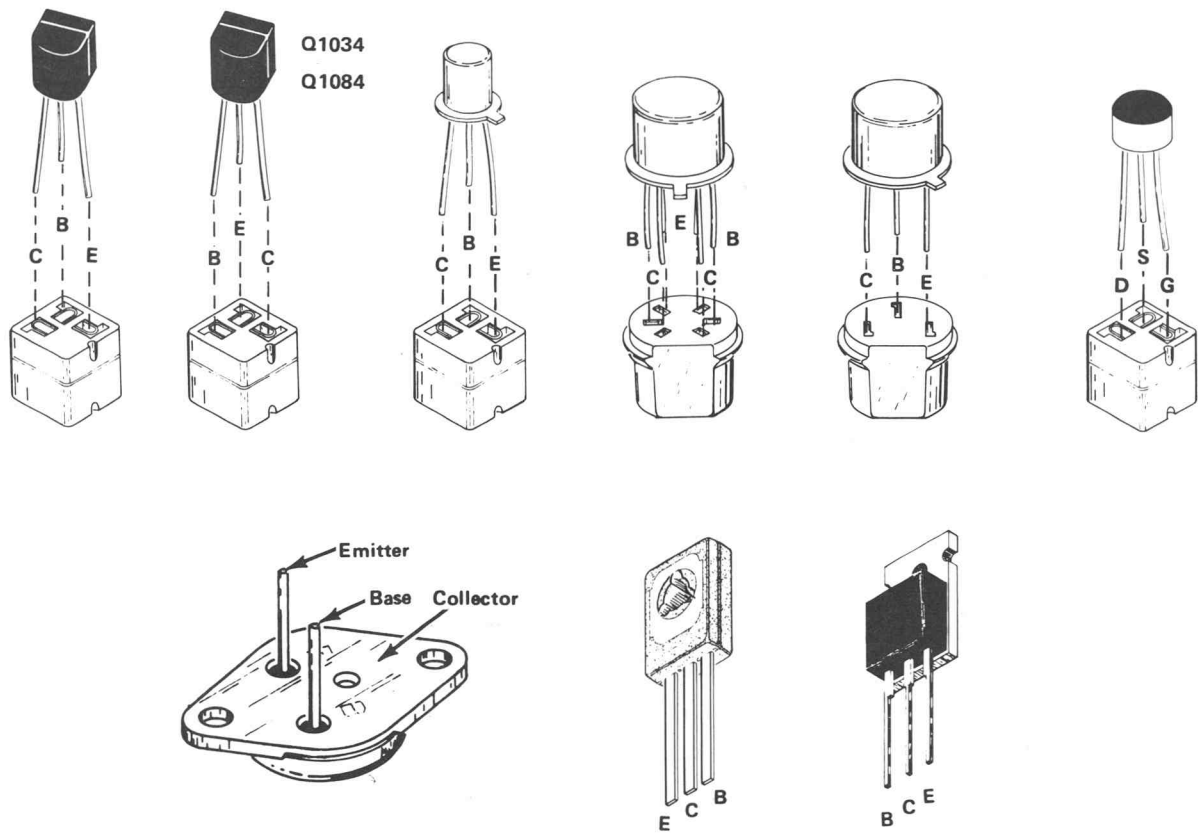
abnormal circuit conditions that could damage the new transistor do not exist. If a substitute transistor is not available, use a dynamic transistor tester such as a Tektronix 576. Static-type testers are not recommended since they do not simulate operating conditions.

Repair and Readjust the Circuit. If a defective component is located, follow the replacement information given in this section of the manual. Check the performance of any circuit that has been repaired or that has had any electrical components replaced.

Replacement Parts

Ordering. All electrical and mechanical replacement parts can be obtained through the local Tektronix Field Office or representative. Many of the standard electronic components can be obtained locally in less time than is required to order from Tektronix Inc. Before purchasing or ordering replacement parts, consult the parts list for value, tolerance, and rating.

TRANSISTORS



INTEGRATED CIRCUITS

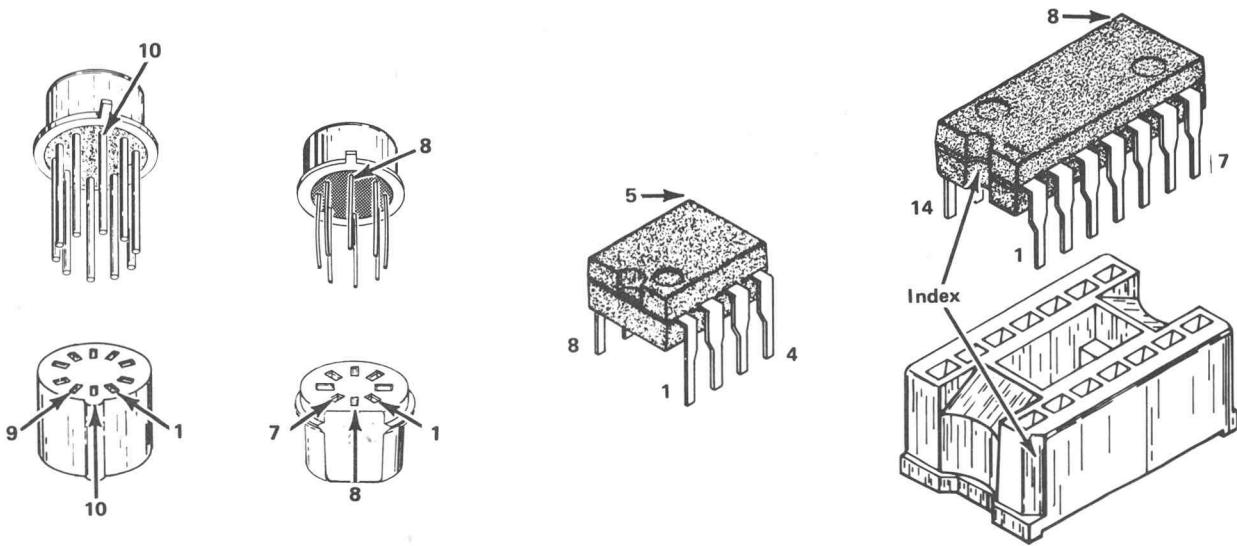


Fig. 3-3. Transistor and Integrated circuit basing diagrams.

When ordering replacement parts from Tektronix Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. Description of the part. (If electrical, include circuit number.)
4. Tektronix Part Number.

NOTE

When selecting replacement parts, it is important to remember that physical size and shape of a component may affect its performance at high frequencies.

Multiple Terminal Connector Holders. Most interconnections between circuit boards, or between chassis-mounted components and circuit boards, are made through pin connectors. The terminals in the connector holders are identified with numbers. Connector orientation to the circuit board is keyed with triangles, one on the holder and one on the circuit board. (See Fig. 3-4.)

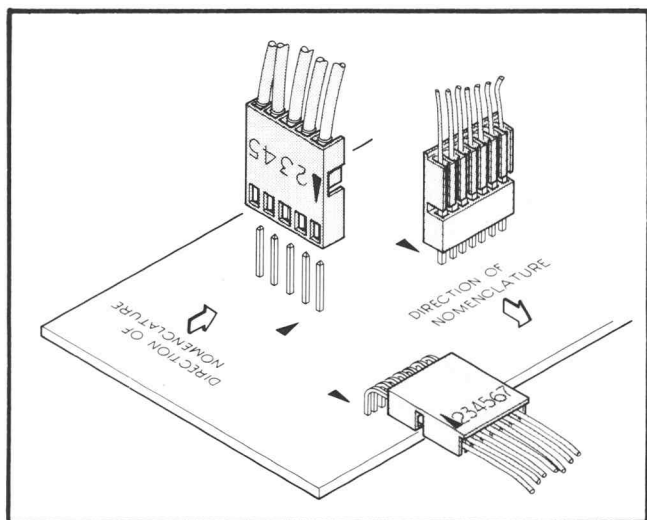


Fig. 3-4. Multiple pin connector holders.

Circuit Boards. If a circuit board is damaged beyond repair, the entire assembly, including all soldered-on parts, can be replaced.

Transistors and Integrated Circuits. Transistors and integrated circuits should not be replaced unless actually

defective. Replacement or exchanges of components may affect the calibration of the instrument. If a transistor or integrated circuit is removed during routine maintenance, return it to its original socket.

Any replacement component should be of the original type or a direct replacement. Bend the leads to fit the socket and cut the leads to the same length as the original part. (See Fig. 3-3 for basing diagrams.)

After any component is replaced, check the operation and calibration of the associated circuits.

Power Transformer. If the power transformer becomes defective, contact the local Tektronix Field Office or representative. Replace only with direct replacement Tektronix transformer.

Cathode-Ray Tube. Use care when handling the cathode-ray tube. Protective clothing and safety glasses should be worn. Do not strike it on any object that might cause it to crack or implode. When storing a cathode-ray tube, place it face down on a smooth surface with a protective cover or soft mat under the faceplate to protect it from scratches.

Cathode-Ray Tube Removal. Use the following procedure to remove the cathode-ray tube.

1. Remove the four deflection plate leads as shown in Fig. 3-5a. Do not bend the cathode-ray tube deflection plate pins.
2. Remove the plastic bezel as shown in Fig. 3-5b.
3. Remove the four Phillips-head screws holding the faceplate protector as shown in Fig. 3-5c.
4. Remove faceplate protector.
5. Remove the rear panel cathode-ray tube base cover plate as shown in Fig. 3-5d.
6. Remove the cathode-ray tube socket as shown in Fig. 3-5e.
7. Turn the clamp screw (Fig. 3-5e) until the cathode-ray tube will slide within the clamp.

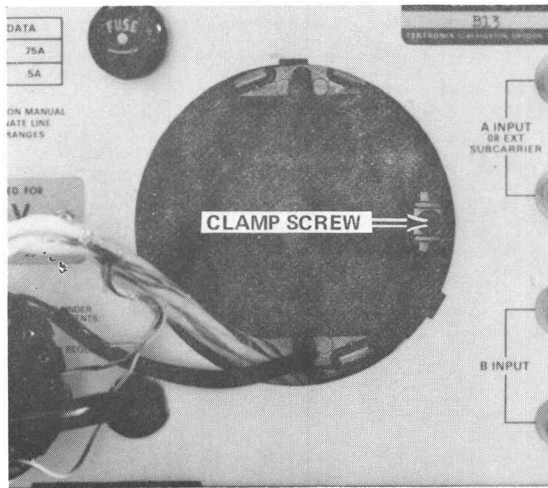
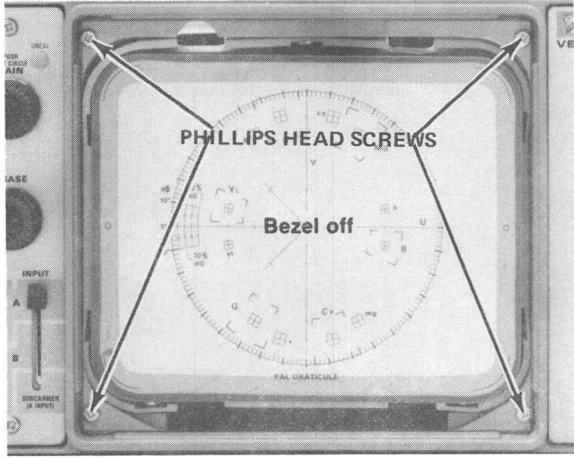
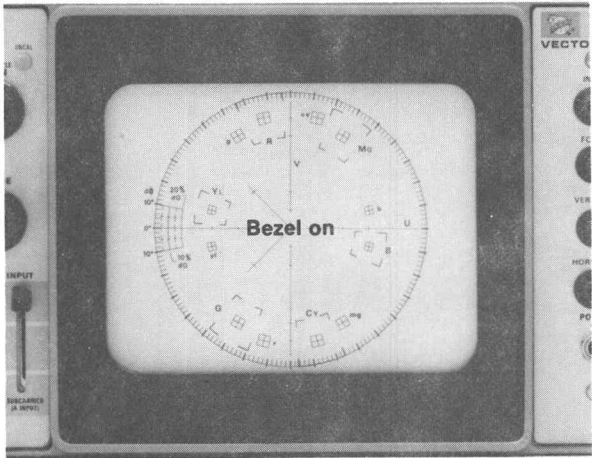
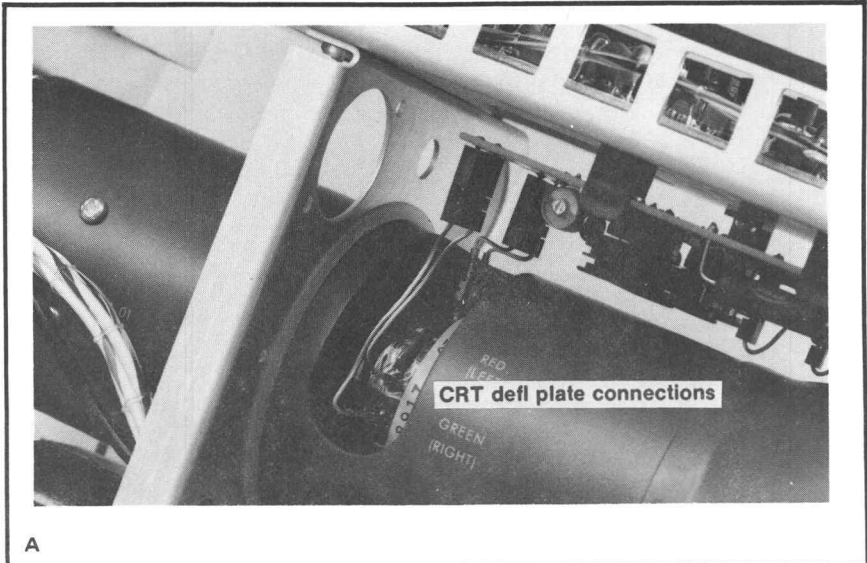


Fig. 3-5. (A), (B), (C), (D), (E), CRT removal.

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8. Push on the cathode-ray tube base to slide the tube forward. Pull the cathode-ray tube out of the shield from the front. Make certain that the deflection plate pins clear the shield.

CAUTION

Handle with care. The high vacuum existing inside a cathode-ray tube creates an implosion hazard that increases with rough handling or scratches on the external surface.

Cathode-Ray Tube Installation. Use the following procedure to install the cathode-ray tube.

1. Slide the tube into the shield. Do not bend the deflection plate pins.
2. Guide the tube into the base clamp. Slide the cathode-ray tube far enough to the rear for the faceplate protector to be replaced.
3. Mount the faceplate protector, using the four Phillips-head screws.
4. Push the cathode-ray tube forward until the faceplate touches the faceplate protector.
5. Tighten the clamp screw.
6. Replace the cathode-ray tube socket, and install the rear panel base cover.
7. Replace the deflection plate pin connectors. Do not bend the deflection plate pins.
8. Snap on the plastic bezel.

PERFORMANCE CHECK/CALIBRATION

Equipment Required

1. Test Oscilloscope. Differential Comparator Bandwidth, dc to at least 30 MHz; minimum deflection factor, 1 mV/div; two vertical channels capable of differential operation; Vertical Amplifier, independent of the Differential Comparator. Tektronix 7603 with 7A13, 7A12, and 7B53A, for example.
2. Test package. Precision DC Voltmeter, accuracy at least $\pm 0.1\%$; Sine wave Generator, variable from 25 Hz to 5 MHz, output amplitude variable from less than 1 Volt to greater than 2 Volts; Frequency Counter, accuracy within 1 part in 10^7 , resolution to 0.1 Hz. For example, Tektronix TM 503 with DM 501, FG 502, and DC 503.
3. Voltage control unit. For example, General Radio W10MT3W Metered Variac Autotransformer.
4. Video signal source. Capable of providing accurate colour bar and modulated staircase test signals. For example, Tektronix 141A or 145.
5. 75 Ω Return Loss Bridge, Tektronix Part Number 067-0576-00.
6. 75 Ω cable (2). Tektronix Part Number 012-0074-00.
7. 75 Ω end-line termination (2). Tektronix Part Number 011-0102-00.
8. 75 Ω feed-through termination. Tektronix Part Number 011-0103-02.
9. 50 Ω to 57 Ω minimum loss attenuator. Tektronix Part Number 011-0057-00.
10. 10X Probe. Tektronix Part Number 010-6053-10.
11. 1X Probe. Tektronix Part Number 010-0120-00.
12. 50 Ω cable (1) Tektronix Part Number 012-0057-01.

13. 50 Ω cable (20 in) Tektronix Part Number 012-0076-00.

14. BNC Cable T Connector. Tektronix Part Number 067-0525-00.

15. BNC T Connector. Tektronix Part Number 103-0030-00.

Setup

a.

1421 ϕ REF	A VECTOR PAL
INPUT	A
GAIN	CAL
PHASE	As is
INTEN FOCUS	Best Display
VERT POS	Centered Display
HORIZ POS	Centered Display
POWER	On

b. Test Oscilloscope (7603 with 7A18 Vertical Amplifier in left compartment, 7A13 Differential Comparator in center compartment, and 7B53A in right compartment).

7603

Power	on
Readout	
Intensity	Best Display
Grat Illum	
Focus	
Vert Mode	press LEFT
Trig Source	press LEFT

7A18

Display Mode	CH 1
Trigger Source	CH 1
CH 1 V/Div	5 mV
input mode	AC
polarity	+up
Var V/Div	Cal
Position	Centered Display

7B53A

Slope Level	Best Display
Main Triggering Mode	Auto
Coupling	AC
Source	Line
Position	Centered Display
Mag	X1
Time/Div	5 ms

c. 145—All switches up for standard PAL Colour Bar Test Signal. Connect Comp Video output through a 75 Ω termination and the BNC Cable T connector to the 1421 A and B INPUT. Leave the loop-through connectors open.

d. Test Package.

DM 501

Range/Function	20 DC Volts
Input	Ext

FG 502

Function	
Multiplier	10^6
Frequency Hz	4.4
Amplitude	6 div cw from Min
Offset	pushed in

DC 503

Trigger	AC Coupled, +Slope
Function	Freq. A (Gate Time 1 s)

Connect the 145 Subcarrier output to the FG 502 VCF input.

Connect the BNC "T" connector to the FG 502 Output. Connect one side of the BNC T through the 20" 50 Ω cable to the DC 503 A Input. Adjust the FG 502 Frequency Hz and Frequency Vernier until the frequency indicated on the DC 503 locks to the subcarrier.

1. Check/Adjust -15 V Supply

a. Connect the DC Voltmeter between ground and the -15 V test point. (See Fig. 3-6).

b. Check—-15 V should be 14.85 to 15.15 volts.

c. Adjust—R3115 (-15 V Adj) for 15 volts.

2. Check +15 V Supply

a. Connect the DC Voltmeter between ground and the ± 15 V test point. (See Fig. 3-6).

b. Check—The +15 V supply should be +14.7 V to +15.3 V.

3. Check +210 V Supply

a. Set the DC Voltmeter range to 1 K DC Volts.

b. Connect the DC Voltmeter between ground and the +210 V test point. (See Fig. 3-6.)

c. Check—The +210 V supply should be +189.0 V to +231.0 V.

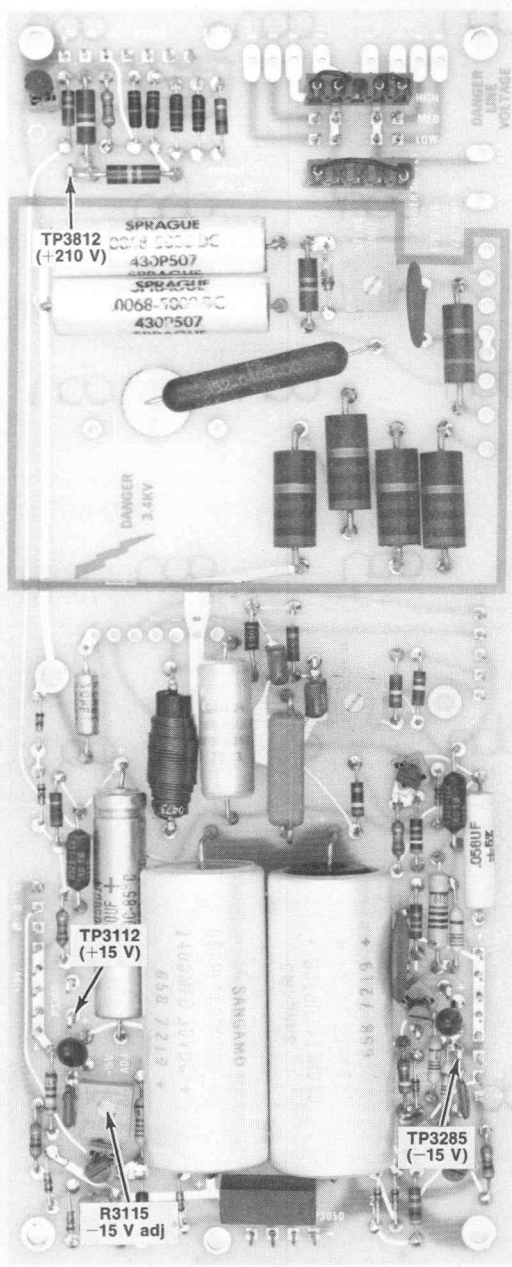


Fig. 3-6. Power supply test points and control.

4. Check/Adjust Intensity Limit

- Rotate the INTEN control until the display is just visible.
- Rotate the PHASE control until the chrominance vectors fall in their proper boxes. (See Fig. 3-7.)
- Rotate the INTEN control for maximum intensity.
- Check—The display amplitude should not change.

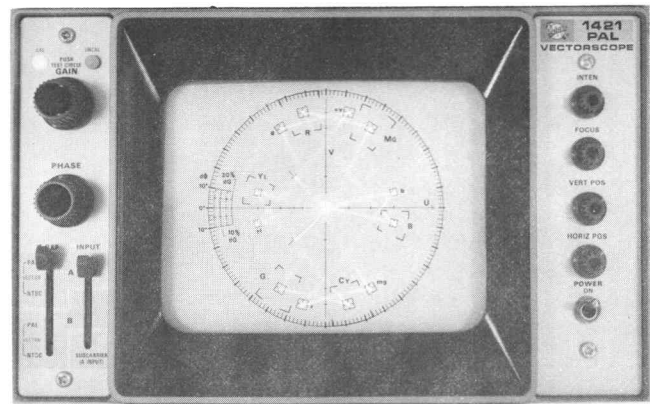


Fig. 3-7. Typical display used when setting Intensity Limit.

- e. Adjust—R3769 (Inten Limit) for maximum brightness without amplitude change as the INTEN control is varied full range.

5. Check/Adjust Astigmatism

- a. Rotate **HORIZ POS** to set the display origin in a clear place in the graticule. Set **FOCUS** fully clockwise.
- b. Check—The display origin should be a round spot (not elongated in any direction).
- c. Adjust—**R3468** (astig) on the Power Supply board until a round display origin is obtained.
- d. Rotate the **FOCUS** control for a well-defined display.

6. Check Power Supply Ripple

- a. Check—Power supply ripple should be as in the following table:

1X Probe From Test Oscilloscope to	Supply	Maximum Ripple
TP3285 (See Fig. 3-6)	−15 V	10 mV
TP3112 (See Fig. 3-6)	+15 V	10 mV
TP3812 (See Fig 3-6)	+210 V	1 V

7. Check/Adjust Input Compensation

- a. Connect the 10X probe from the Test Oscilloscope to TP1010 on the Demodulator board (see Fig. 3-8).

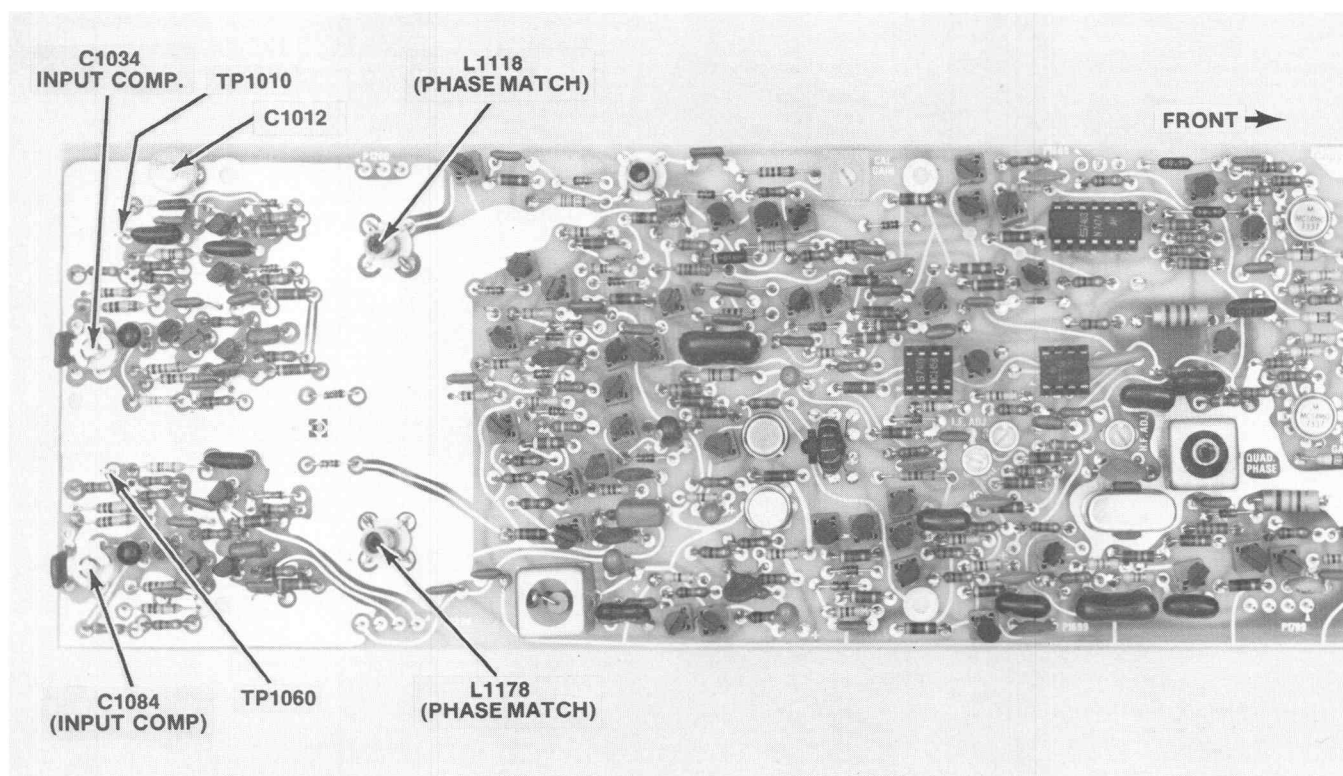


Fig. 3-8. Input amplifier test points and adjustments.

- b. Check—The colour bar wave form displayed on the Test Oscilloscope should have flat top white bar and flat sync tip. See Fig. 3-9.
- c. Adjust—C1034 (A Input Comp) for flat top white bar and flat sync tip. See Fig 3-9.
- d. Move the 10X probe to TP1060 (see Fig. 3-8).
- e. Check—The Test Oscilloscope display should appear the same as part b of this step. See Fig. 3-9.
- f. Adjust—C1084 (B Input Comp) for flat top white bar and flat sync tip. See Fig 3-9.
- g. Remove the 10X probe.

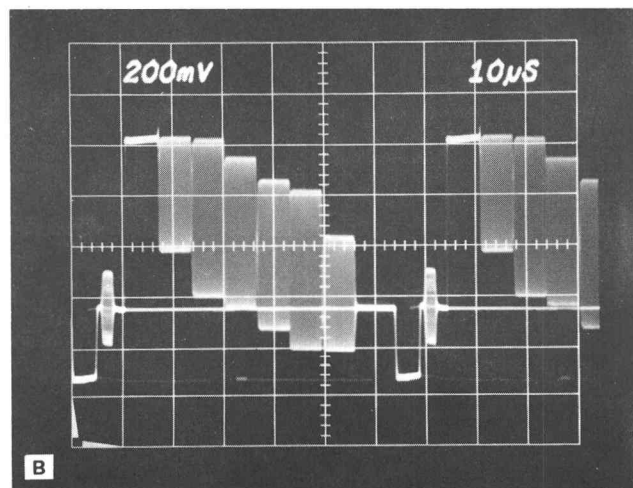
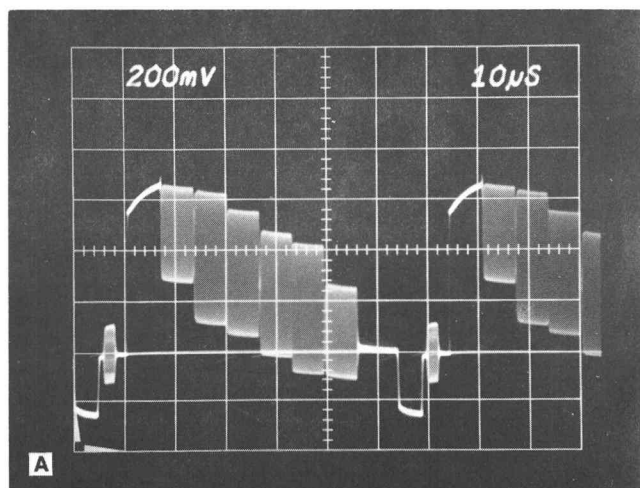


Fig. 3-9. (A) Input compensation, incorrect; (B) Correct.

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8. Check/Adjust Quadrature Phase

- Press the PUSH (TEST CIRCLE) button.
- Check—The test circles should be overlayed. See Fig. 3-10.
- Adjust—L1666 (Quad Phase) to overlay the test circles. (See Fig. 3-10.)
- Release the PUSH (TEST CIRCLE) button.
- Remove the BNC Cable "T" connector hook-up from the 1421 A INPUT.

9. Check/Adjust Gain

- Connect the Sine-wave Generator Output through 50 Ω cable and the 50 Ω to 75 Ω Minimum Loss Attenuator to the 1421 A INPUT. Terminate the A INPUT loop-through in 75 Ω .

- Connect the 10X probe from the Test Oscilloscope vertical input to TP1010 on the Demodulator board. Set the INPUT switch to A and ϕ REF to A VECTOR PAL.
- Adjust the Sine-wave Generator amplitude for 796 mV, as observed on the Test Oscilloscope.
- Check—The display should be within 1% of the graticule edge. See Fig. 3-11.
- Adjust—R1403 (Cal Gain) until the display amplitude is within 1% of the graticule edge on the V axis.
- Check—The display amplitude should be within 1% of the graticule edge. See Fig. 3-11.
- Adjust—R1759 (H Gain) until the display amplitude is within 1% of the graticule edge on the U axis.

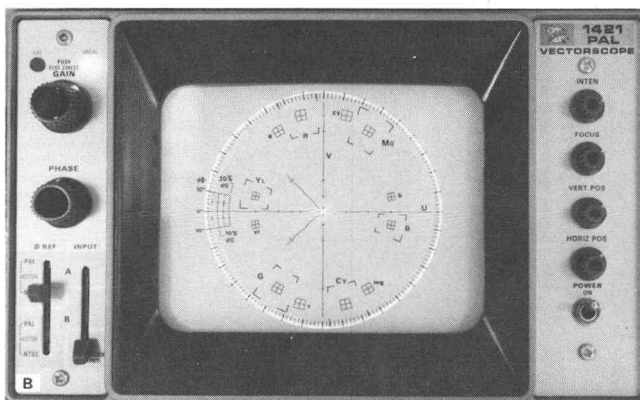
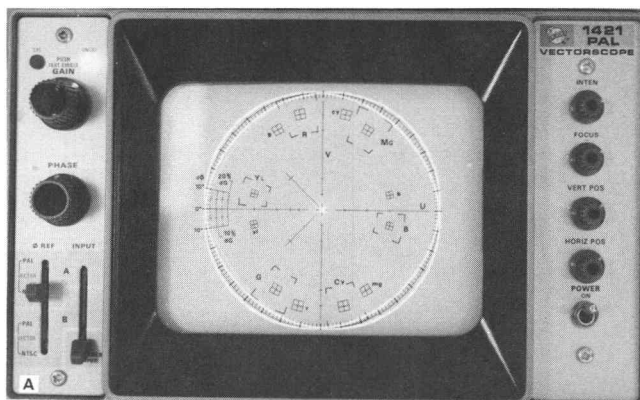


Fig. 3-10. (A) Quadrature phase, incorrect; (B) Correct.

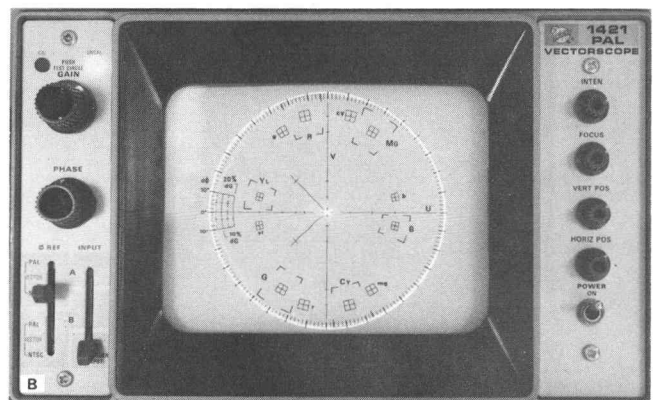
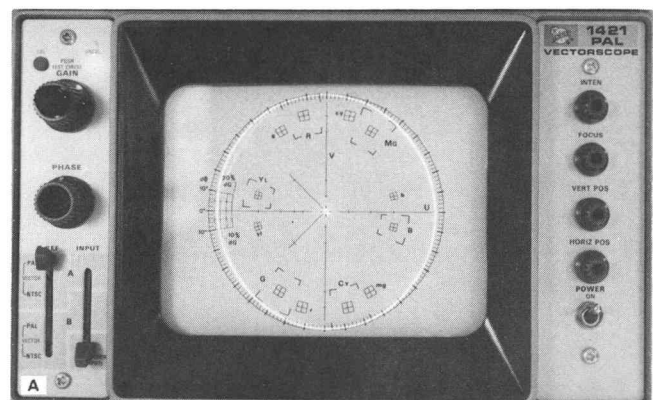


Fig. 3-11. Gain adjustment, typical display: (A) Cal Gain and H Gain incorrect; (B) Correct.

- h. Remove the Sine-wave Generator connection and the 75 Ω termination from the A INPUT.
- i. Connect the arm of the BNC Cable "T" connector, removed in step 10e, to the A INPUT.

10. Check GAIN Range

- a. Set the Video Generator output for a staircase, modulated with 140 mV of subcarrier. Note the position of the 140 mV subcarrier vector on the 1421 graticule.
- b. Rotate the GAIN control just out of detent to the minimum amplitude position.
- c. Set the Video Generator for 280 mV of subcarrier on the staircase signal.
- d. Check—The 280 mV subcarrier vector should be the same size as, or smaller than, the 140 mV vector noted in part a.
- e. Set the Video Generator for 140 mV of subcarrier on the staircase signal.
- f. Rotate the GAIN control fully clockwise.
- g. Check—The 140 mV subcarrier vector should be at least at the graticule edge.
- h. Set the GAIN control to CAL.
- i. Set the Video Generator Output for standard PAL colour bars.

11. Check/Adjust Input Phase Match

- a. Rotate the PHASE control to set all colour dots at their proper graticule marks.
- b. Set the INPUT switch to B.
- c. Check—The channel B display should be at the same phase as the channel A display.
- d. Adjust—L1178 (B Phase Match) until the channel B display is the same phase as the channel A display.

Note: If L1178 has insufficient range to obtain the desired result, adjust L1118 (A Phase Match) until both channels are phased the same.

12. Check Phase Shift

- a. Move the INPUT switch back and forth between A and B.
- b. Check—Phase shift with INPUT switch change should be 0.5° or less.
- c. Move the ϕ REF switch back and forth between A VECTOR NTSC and B VECTOR NTSC.
- d. Check—Phase shift with ϕ REF switch change should be 0.5° or less.
- e. Rotate the GAIN control to vary the display amplitude from minimum to the point at which the burst vector lies on the graticule edge.
- f. Check—Phase shift with GAIN change should be 1.0° or less.
- g. Adjust—L1305 (Phase Bal) for minimum phase shift with GAIN variation.
- h. Rotate the GAIN control to set the burst vector on the graticule edge.
- i. Move the INPUT switch back and forth between A and SUBCARRIER (A INPUT).
- j. Check—Phase shift should be 0.5° or less.
- k. Adjust—C1012 (Sub Ch Comp) for minimum phase shift as the INPUT switch is moved between A and SUBCARRIER (A INPUT).

13. Check/Adjust Gain Match

- a. Rotate the PHASE control until all chrominance portions of the display are at their proper graticule marks. Set the GAIN control to the CAL position.
- b. Set the INPUT switch to B.

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- c. Check—The channel B display should be the same amplitude as the channel A display.
- d. Adjust—C1084 (B Input Comp) until the channel B display is the same amplitude as the channel A display.

14. Check/Adjust U and V Alignment

- a. Set the ϕ REF switch to B VECTOR NTSC.
- b. Set the Video Generator Colour Bar U switch off.
- c. Rotate the PHASE control for best overlay of colour dots.
- d. Check—All colour dots should fall within 1° of the V axis graticule line.
- e. Adjust—R1916 (V Align) until all colour dots fall within 1° of the V axis graticule line.
- f. Set the Video Generator Colour Bar U switch on, and Colour Bar V switch off.
- g. Check—All colour dots should fall within 1° of the U axis graticule line.
- h. Adjust—R1951 (H Align) until all colour dots fall within 1° of the U axis graticule line.
- i. Set the Video Generator Colour Bar V switch on.

15. Check/Adjust Filters

- a. Connect the 10X probe from the Test Oscilloscope to TP1919. See Fig. 3-12.
- b. Check—The demodulated V chrominance should be free from rolloff, peaking, and ringing. See Fig. 3-12.
- c. Adjust—L1821 and L1827 (V Filter) for best transient response.
- d. Move the 10X probe to TP1954. See Fig. 3-13.
- e. Check—The demodulated U chrominance should be free from rolloff, peaking, and ringing. See Fig. 3-13.

- f. Adjust—L1841 and L1847 (U Filter) for best transient response.

16. Check/Adjust Deflection Amplifier Match

- a. Remove the wire from P1950-1 (see Fig. 3-14) and touch it to the wire in P1901-2. See Fig. 3-14. The 1421 display should be a line at a 45° angle.
- b. Check—The display should be overlayed (no gap between lines).

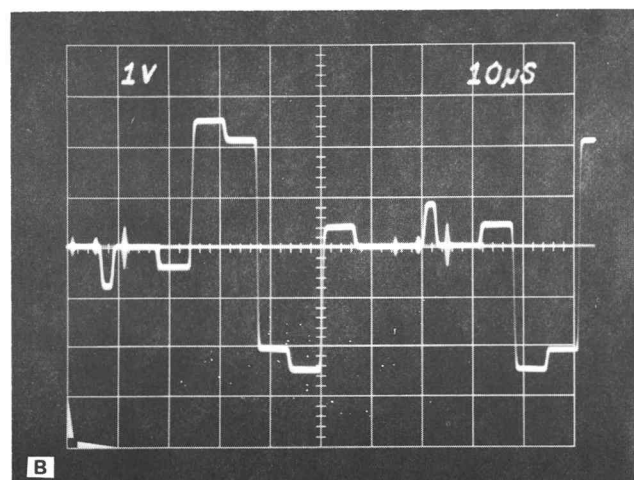
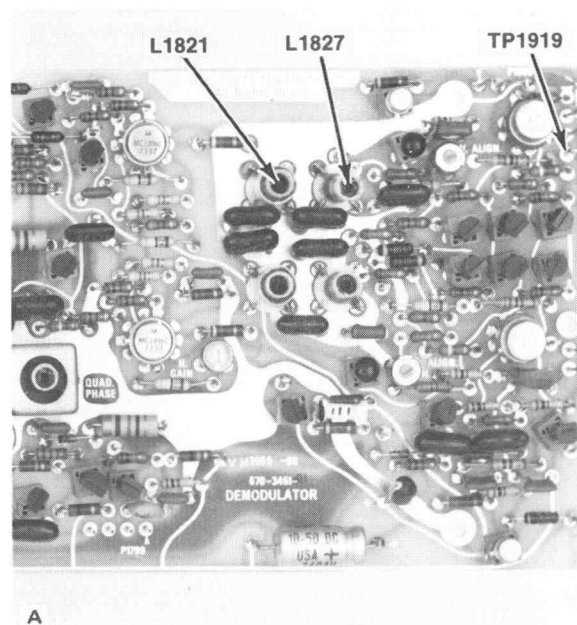


Fig. 3-12. (A) V Filter test points and adjustments; (B) Typical waveform at TP1919.

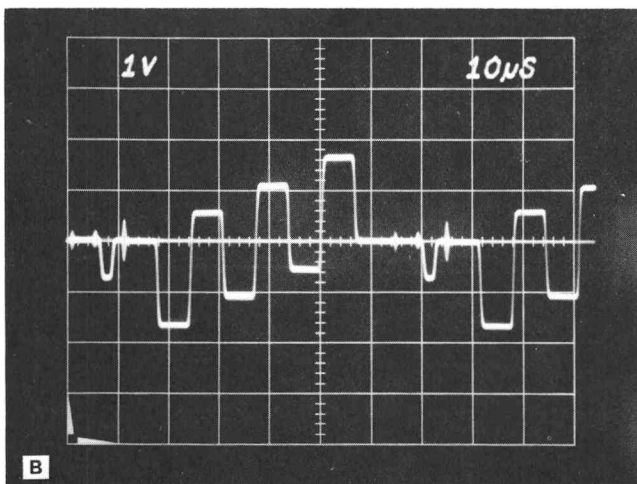
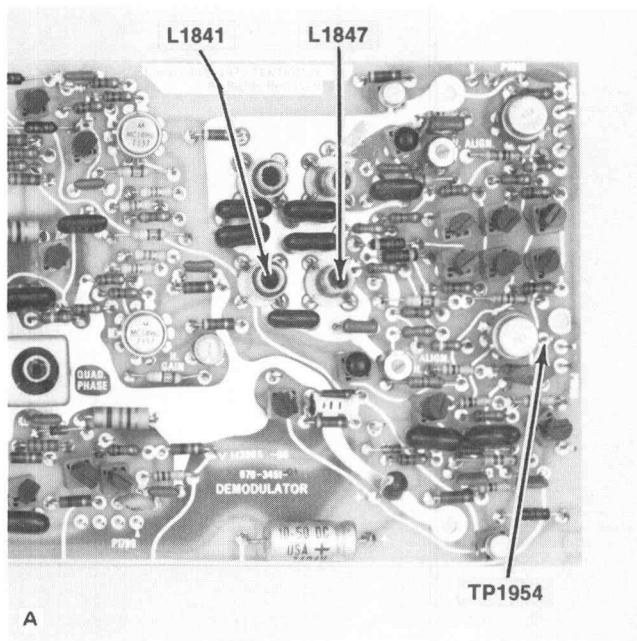


Fig. 3-13. (A) U Filter test points and adjustments; (B) Typical waveform at TP1954.

c. Adjust—C2891 (Defl Comp) for the best display overlay.

d. Connect the wire removed in part a to P1950-1.

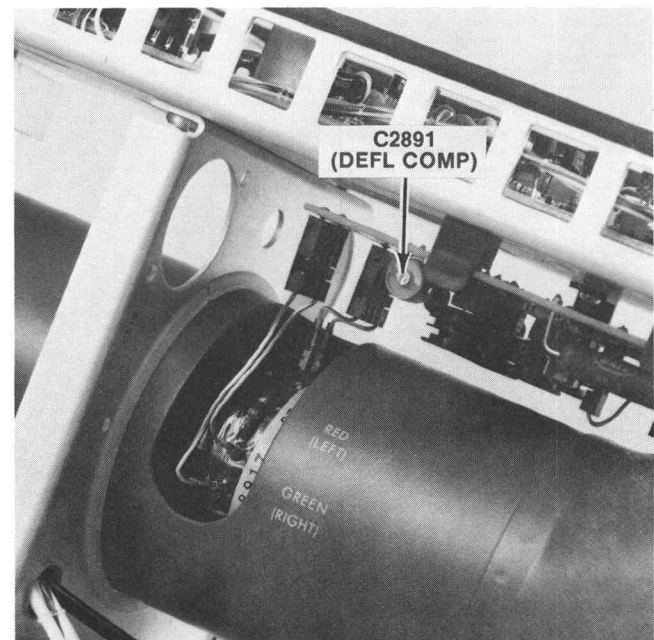
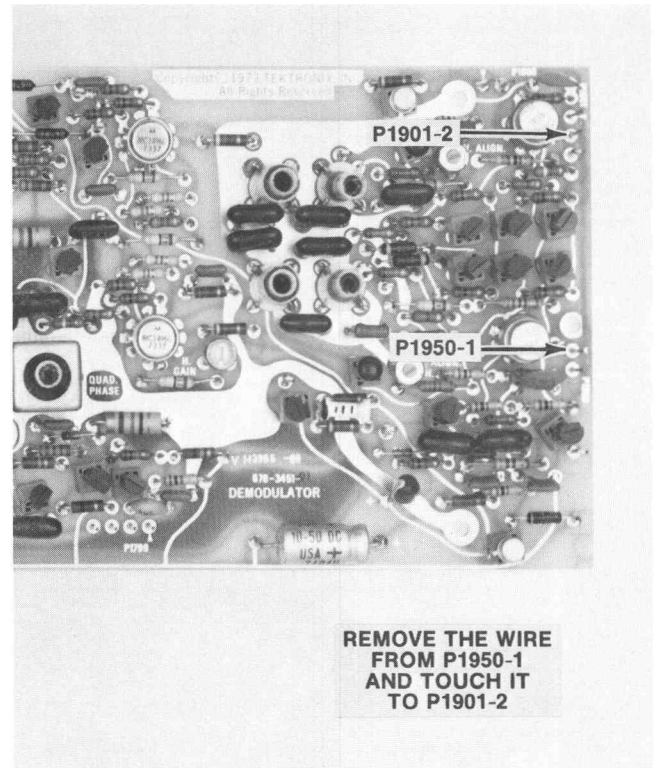


Fig. 3-14. Deflection compensation test points and control.

17. Check/Adjust Oscillator Range

- Connect the 1X probe from the Test Package digital counter to TP1775 on the Demodulator board. See Fig. 3-15. The digital counter will display the subcarrier frequency.
- Connect a short piece of wire between P1699 and the + voltage pin. See Fig. 3-15.
- Check—The digital counter should read subcarrier frequency minus 100 Hz.
- Adjust—R1554 (LF Adj) for subcarrier frequency minus 100 Hz.
- Move the short piece of wire to connect P1699 to the -voltage pin. See Fig. 3-15.
- Check—The digital counter should read subcarrier frequency plus 100 Hz.
- Adjust—R1652 (HF Adj) for subcarrier frequency plus 100 Hz.

Note: These two adjustments interact. Repeat as necessary to obtain the desired result.

18. Check/Adjust DC Balance

- Connect the 10X probe from the Test Oscilloscope to TP1544. (See Fig. 3-16a.) Turn the Video Generator Bruch Sequence off.
- Check—The crossover point of two successive field sync pulses, time overlayed, should be at 0 Vdc. (See Fig. 3-16c.)
- Adjust—R1561 (DC Bal) until the crossover point of two successive field sync pulses, time overlayed, is 0 Vdc.

19. Check Chrominance Bandwidth.

- Remove the arm of the BNC cable "T" connector that is connected to the 1421 A INPUT.
- Connect the Sine-wave Generator output through 50 Ω cable and the 50 Ω to 75 Ω Minimum Loss Attenuator to the 1421 A INPUT. Make sure the Sine-wave Generator is locked to the Video

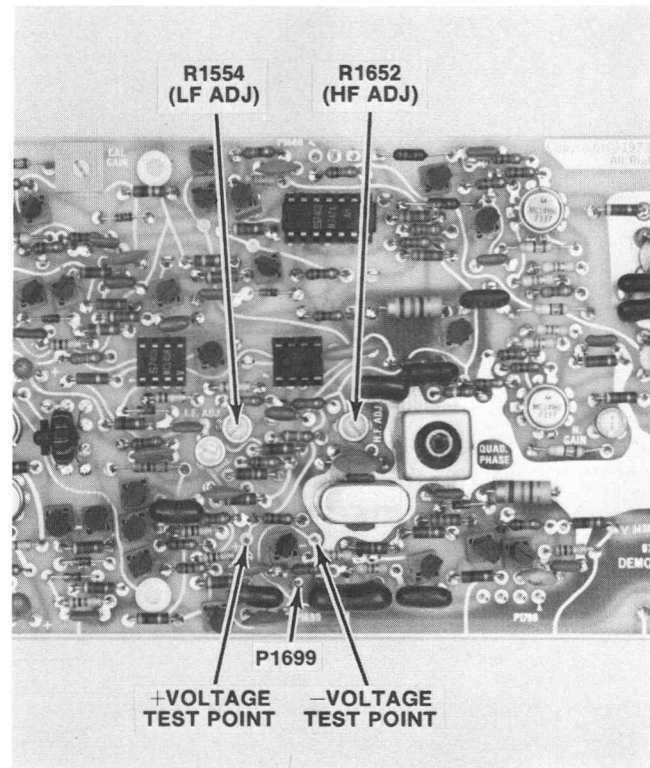


Fig. 3-15. Oscillator range test points and adjustments.

Generator subcarrier. Monitor the Sine-wave Generator output with the digital counter.

- Adjust the Sine-wave Generator amplitude until the display falls on the graticule edge.
- Decrease the Sine-wave Generator frequency until the display falls on the outer lines of the large blue and yellow graticule boxes. (70% amplitude.)
- Check—The frequency, as read on the digital counter, should be 3.833 MHz to 4.033 MHz.
- Increase the Sine-wave Generator frequency until the display again falls on the outer lines of the blue and yellow graticule boxes.
- Check—The frequency, as read on the Digital Counter, should be 4.833 MHz to 5.033 MHz.
- Set the Sine-wave Generator for 4.43361875 MHz.

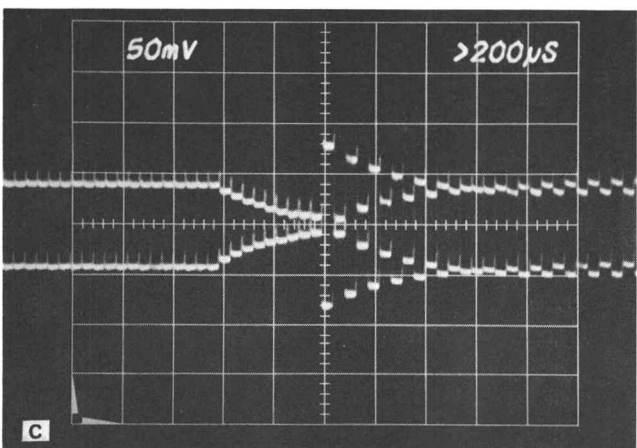
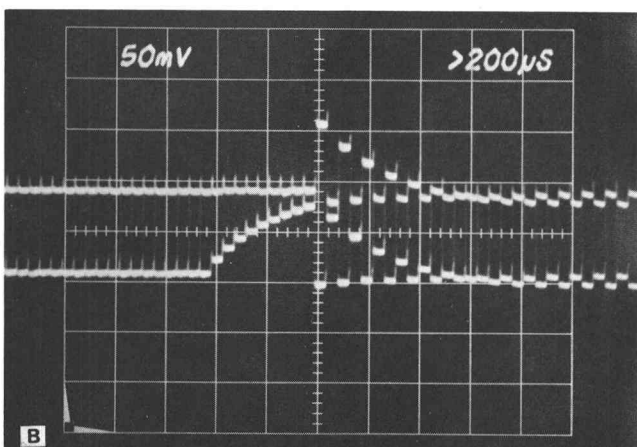
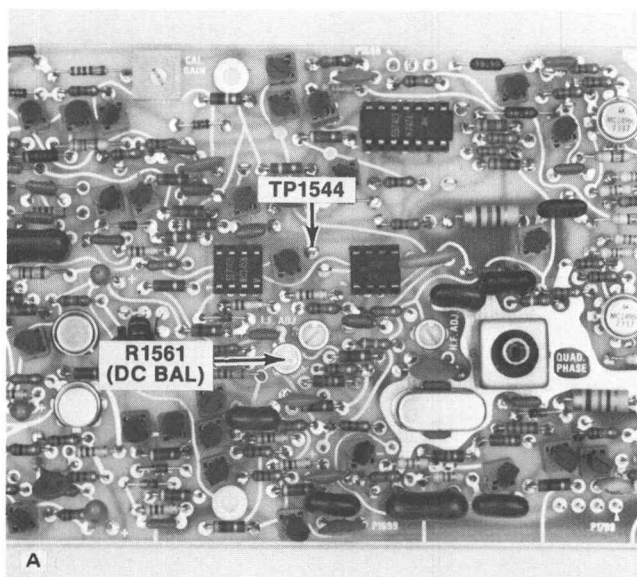


Fig. 3-16. (A) DC Balance test point and control; (B) Incorrect DC Balance adjustment; (C) Correct DC Balance adjustment.

20. Check Oscillator Pull In Range and Time

- Increase the Sine-wave Generator frequency until the 1421 display unlocks, then decrease the frequency until the 1421 display locks again.
- Check—The Sine-wave Generator Frequency, as monitored on the Digital Counter should be 50 Hz or more above subcarrier frequency.
- Check—The 1421 should lock within 1 second when the Sine-wave Generator frequency is within 50 Hz of subcarrier frequency.
- Decrease the Sine-wave Generator frequency until the 1421 display unlocks, then increase the frequency until the 1421 display locks again.
- Check—The Sine-wave Generator frequency should be 50 Hz or more below subcarrier frequency.
- Check—The 1421 should lock within 1 second when the Sine-wave Generator frequency is within 50 Hz of subcarrier frequency.

21. Check Position Control Range

- Rotate the VERT POS control throughout its range.
- Check—The display origin should move at least 1/4 inch above and below graticule center.
- Rotate the HORIZ POS control throughout its range.
- Check—The display origin should move at least 1/4 inch left and right of graticule center.

22. Check Clamp Stability

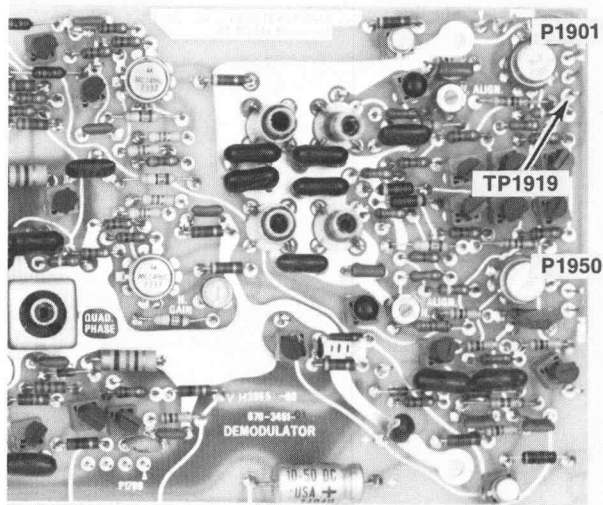
- Center the display origin, using the position controls.
- Check—The display origin should not shift more than 1/64 inch as the PHASE control is rotated.
- Disconnect the Sine-wave Generator from the 1421 A INPUT and the 75 Ω termination from the A INPUT loop through.

Maintenance and Calibration—1421

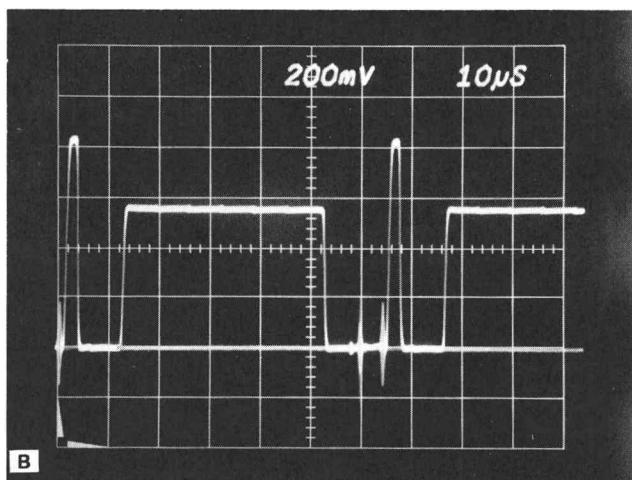
- d. Connect the arm of the BNC Cable "T" connector that was removed in step 21a to the 1421 A INPUT.

23. Check Differential Gain

- a. Connect the 10X probe from the Test Oscilloscope Differential Comparator to TP1919 on the Demodulator board.
- b. Set the Video Generator output for a staircase modulated with 140 mV of subcarrier.
- c. Rotate the PHASE control for maximum amplitude of the demodulated subcarrier, as monitored on the Test Oscilloscope. See Fig. 3-17.



A



B

Fig. 3-17. Differential Gain setup.

Note the amplitude of the demodulated subcarrier signal.

- d. Set the Differential Comparator Volts/Div to 1 mV and use the Comparison Voltage controls to view the top of the demodulated subcarrier.
- e. Check—Tilt on the demodulated subcarrier signal should not exceed 1% of the value noted in part c. See Fig. 3-18. (Tilt caused by changing luminance levels can be checked by switching staircase steps on and off.)

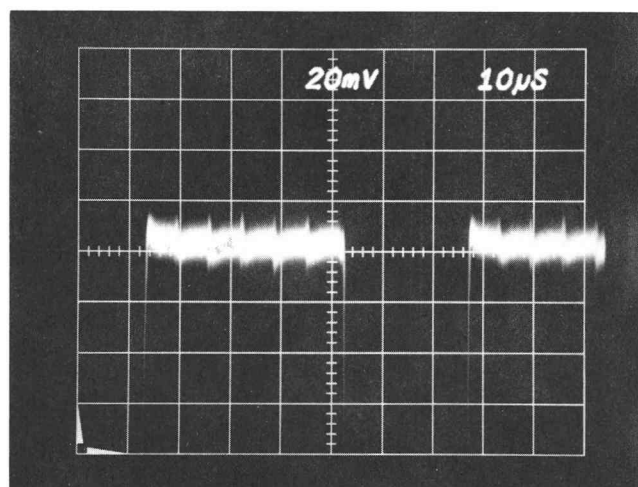


Fig. 3-18. Differential Gain check.

24. Check Differential Phase

- a. Set the Differential Comparator Comparison Voltage off.
- b. Rotate the 1421 PHASE control for minimum amplitude of the demodulated subcarrier. See Fig. 3-19.
- c. Check—Tilt caused by changing luminance levels should not exceed 2% of the value noted in step 25c. (2% is equal to 1° of differential phase.) See Fig. 3-20.
- d. Remove the 10X probe from the 1421.

25. Check Isolation

- a. Remove the BNC Cable "T" from the 1421 inputs.
- b. Connect the Video Generator output to the 1421 A INPUT. Terminate the A INPUT loop-through in 75 Ω.

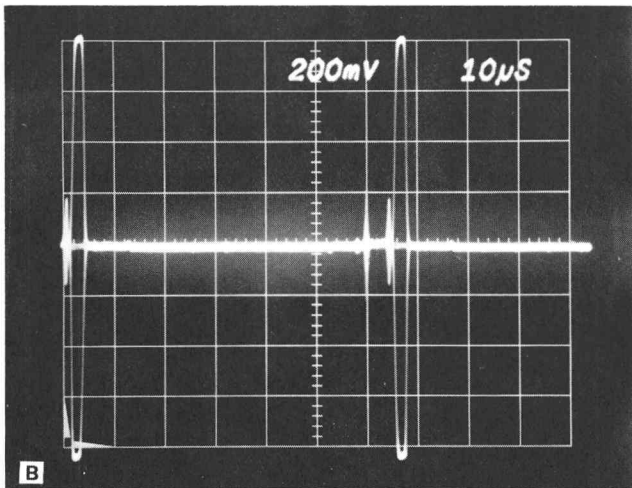
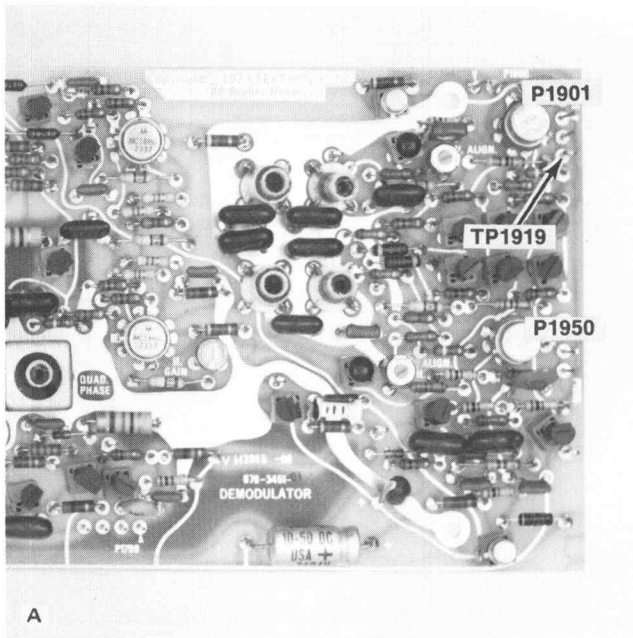


Fig. 3-19. Differential Phase setup.

- c. Connect the 1421 B INPUT through 75 Ω cable and 75 Ω termination to the Test Oscilloscope Differential Comparator input.
- d. Set the Video Generator output for a pedestal modulated by 700 mV of subcarrier.
- e. Check—The amplitude of the subcarrier monitored on the Test Oscilloscope should be 0.07 mV or less.

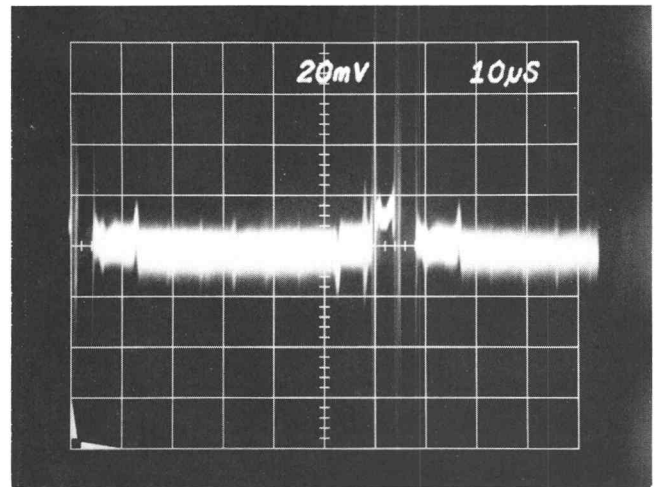


Fig. 3-20. Differential Phase check.

26. Check Burst Jitter

- a. Set the INPUT switch to B and ϕ to B VECTOR PAL.
- b. Set the 1421 GAIN control so the burst tips fall on the graticule edge.
- c. Check—The burst jitter should not exceed 0.5° .
- d. Remove all connections from the 1421 and the Test Oscilloscope.

27. Check Input Return Loss

- a. Connect the Return Loss Bridge to the Test Oscilloscope Differential Comparator. Set the Differential Comparator for differential measurements.
- b. Connect the Sine-wave Generator Output through a "T" connector to the Return Loss Bridge input (see the Return Loss Bridge instruction manual) and to the Test Oscilloscope Vertical Amplifier.
- c. Set the Test Oscilloscope for alternate channel viewing.
- d. Set the Sine-wave Generator Frequency controls for 50 kHz output.
- e. Remove the 75 Ω termination from the Return Loss Bridge Unknown arm.

Maintenance and Calibration—1421

- g. Connect the Return Loss Bridge Unknown arm to the 1421 A INPUT. Terminate the 1421 A INPUT loop-through with the 75 Ω termination.
- h. Check—Return loss should not exceed 2.5 mV as frequency is varied from 50 Hz to 5 MHz. Maintain constant sine-wave amplitude as monitored on the Test Oscilloscope Vertical Amplifier channel.
- i. Repeat parts g and h for the 1421 B INPUT.

OPTIONS

This section provides for documenting catalog options offered for the 1421. Custom modifications are negotiated and documented separately.

Option 1 No Metal Cabinet

This instrument is normally shipped in a metal cabinet, Tektronix Part Number 437-0100-00. If the metal cabinet is not desired, order 1421, Option 1.

Option 2 Field Case

For portable use, a blue-vinyl painted aluminum case (Tektronix Part Number 390-0018-01) with handle and rubber feet is available. It can be ordered separately, or if this instrument is not intended for rack use, can be shipped on the instrument from the factory. Order 1421, Option 2.

[illegible]

ELECTRICAL REPLACEABLE PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	SEP	SEPARATELY
FXD	FIXED	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	Sangamo Electric Co., S. Carolina Div.	P. O. Box 128	Pickens, SC 29671
01002	General Electric Co., Industrial and Power Capacitor Products Dept.	John St.	Hudson Falls, NY 12839
01121	Allen-Bradley Co.	1201 2nd St. South	Milwaukee, WI 53204
01295	Texas Instruments, Inc., Components Group	P. O. Box 5012	Dallas, TX 75222
02735	RCA Corp., Solid State Division	Route 202	Somerville, NY 08876
03508	General Electric Co., Semi-Conductor Products Dept.	Electronics Park	Syracuse, NY 13201
04713	Motorola, Inc., Semiconductor Products Div.	5005 E. McDowell Rd.	Phoenix, AZ 85008
07263	Fairchild Semiconductor, A Div. of Fairchild Camera and Instrument Corp.	464 Ellis St.	Mountain View, CA 94040
07910	Teledyne Semiconductor	12515 Chadron Ave.	Hawthorne, CA 90250
09353	C and K Components, Inc.	103 Morse Street	Watertown, MA 02172
12040	National Semiconductor Corp.	Commerce Drive	Danbury, CT 06810
12697	Clarostat Mfg. Co., Inc.	Lower Washington St.	Dover, NH 03820
14936	General Instrument Corp., Semiconductor Products Group	600 W. John St.	Hicksville, NY 11802
15818	Teledyne Semiconductor	1300 Terra Bella Ave.	Mountain View, CA 94040
18324	Signetics Corp.	811 E. Arques	Sunnyvale, CA 94086
18788	General Illumination Inc.	2233 University Ave.	St. Paul, MN 55114
25403	Amperex Electronic Corp., Semiconductor and Microcircuits Div.	Providence Pike	Slatersville, RI 02876
27014	National Semi-Conductor Corp.	2900 San Ysidro Way	Santa Clara, CA 95051
32159	West-Cap Arizona	2201 E. Elvira Road	Tucson, AZ 85706
56289	Sprague Electric Co.	31 South St.	North Adams, MA 01247
63743	Ward Leonard Electric Co., Inc.		Mount Vernon, NY 10550
71400	Bussman Mfg., Division of McGraw Edison Co.	2536 W. University St.	St. Louis, MO 63107
71590	Centralab Electronics, Div. of Globe-Union, Inc.	5757 N. Green Bay Ave.	Milwaukee, WI 53201
72136	Electro Motive Mfg. Co., Inc., The	South Park and John Streets	Willimantic, CT 06226
72982	Erie Technological Products, Inc.	644 W. 12th St.	Erie, PA 16512
73138	Beckman Instruments, Inc., Helipot Div.	2500 Harbor Blvd.	Fullerton, CA 92634
74970	Johnson, E. F., Co.	299 10th Ave. S. W.	Waseca, MN 56093
75042	TRW Electronic Components, IRC Fixed Resistors, Philadelphia Division	401 N. Broad St.	Philadelphia, PA 19108
75378	CTS Knights, Inc.	222 Reimann Ave.	Sandwich, IL 60548
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97005
80294	Bourns, Inc., Instrument Div.	6135 Magnolia Ave.	Riverside, CA 92506
80740	Beckman Instruments, Inc.	2500 Harbor Blvd.	Fullerton, CA 92634
81483	International Rectifier Corp.	9220 Sunset Blvd.	Los Angeles, CA 90069
83003	Varo, Inc.	800 W. Garland Ave.	Garland, TX 75040
90201	Mallory Capacitor Co., Div. of P. R. Mallory Co., Inc.	3029 E. Washington St.	Indianapolis, IN 46206
91637	Dale Electronics, Inc.	P. O. Box 609	Columbus, NB 68601
99217	Bell Industries, Electronic Components Div.	150 W. Cypress Ave.	Burbank, CA 91502

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3451-01		CKT BOARD ASSY:DEMOMULATOR	80009	670-3451-01
A2	670-3450-00		CKT BOARD ASSY:DEFLECTION AMPLIFIER	80009	670-3450-00
A3	670-3134-00		CKT BOARD ASSY:POWER SUPPLY	80009	670-3134-00
A4	670-3676-00		CKT BOARD ASSY:INPUT AMPLIFIER	80009	670-3676-00
C233	283-0638-00		CAP.,FXD,MICA:130PF,1%,100V	00853	D151B131FO
C235	283-0638-00		CAP.,FXD,MICA:130PF,1%,100V	00853	D151B131FO
C238 ¹					
C433	290-0647-00		CAP.,FXD,ELCTLT:10UF,+50-10%,475V	56289	43D100F475GJ4
C1010	283-0674-00		CAP.,FXD,MICA D:85PF,1%,500V	00853	D155F850FO
C1012	281-0093-00		CAP.,VAR,CER DI:5.5-18PF	72982	538-011COP092R
C1032	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C1034	281-0168-00		CAP.,VAR,AIR DI:1.3-5.4PF,250V	74970	187-0103-035
C1036	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1046	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1074	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1076	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1082	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C1084	281-0168-00		CAP.,VAR,AIR DI:1.3-5.4PF,250V	74970	187-0103-035
C1086	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1116	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1120	283-0674-00		CAP.,FXD,MICA D:85PF,1%,500V	00853	D155F850FO
C1124	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1136	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C1142	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1160	283-0674-00		CAP.,FXD,MICA D:85PF,1%,500V	00853	D155F850FO
C1178	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C1188	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1204	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1242	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C1243	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1285	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1286	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1303	283-0268-00		CAP.,FXD,CER DI:0.015UF,10%,50V	72982	8131N075W5R153K
C1314	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1322	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C1333	283-0239-00		CAP.,FXD,CER DI:0.022UF,10%,50V	72982	8131N075WR5223K
C1336	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1337	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1338	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1346	283-0655-00		CAP.,FXD,MICA D:0.0033UF,1%,500V	00853	D195F332FO
C1361	290-0527-00		CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C1364	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C1373	290-0529-00		CAP.,FXD,ELCTLT:47UF,20%,20V	56289	196D476X0020LA3
C1374	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C1377	290-0536-00		CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C1383	290-0536-00		CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C1395	283-0634-00		CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650FO
C1427	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1428	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C1430	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C1435	283-0010-00		CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C1444	290-0536-00		CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C1482	283-0004-00		CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855016Z5V0203Z
C1494	290-0536-00		CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C1497	283-0024-00		CAP.,FXD,CER DI:0.1UF,+80-20%,30V	56289	273C16
C1505	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C1532	283-0198-00		CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8131N075651224M

¹ Furnished as a unit with 119-0648-00.

Electrical Parts List—1421

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C1533	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1553	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1555	283-0198-00		CAP., FXD, CER DI:0.22UF, 20%, 50V	72982	8131N075651224M
C1564	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1566	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1571	283-0691-00		CAP., FXD, MICA D:650PF, 1%, 300V	72136	DM15F651F0300
C1587	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1592	283-0598-00		CAP., FXD, MICA D:253PF, 5%, 300V	00853	D153E2530J0
C1646	283-0660-00		CAP., FXD, MICA D:510PF, 2%, 500V	00853	D155F511G0
C1647	283-0104-00		CAP., FXD, CER DI:2000PF, 5%, 500V	72982	811-565B202J
C1653	283-0698-00		CAP., FXD, MICA D:390PF, 1%, 500V	00853	D15-3E545070
C1662	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1671	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1685	283-0597-00		CAP., FXD, MICA D:470PF, 10%, 300V	00853	D153E471K0
C1690	283-0655-00		CAP., FXD, MICA D:0.0033UF, 1%, 500V	00853	D195F332F0
C1699	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1701	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1720	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1731	283-0674-00		CAP., FXD, MICA D:85PF, 1%, 500V	00853	D155F850F0
C1744	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1784	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1788	283-0000-00		CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C1829	283-0647-00		CAP., FXD, MICA D:70PF, 1%, 100V	00853	D151E700F0
C1830	283-0605-00		CAP., FXD, MICA D:678PF, 1%, 300V	00853	D153F678F0
C1831	283-0680-00		CAP., FXD, MICA D:330PF, 1%, 500V	00853	D15-5E331F0
C1835	283-0605-00		CAP., FXD, MICA D:678PF, 1%, 300V	00853	D153F678F0
C1836	283-0680-00		CAP., FXD, MICA D:330PF, 1%, 500V	00853	D15-5E331F0
C1850	283-0647-00		CAP., FXD, MICA D:70PF, 1%, 100V	00853	D151E700F0
C1865	281-0504-00		CAP., FXD, CER DI:10PF, +/-1PF, 500V	72982	301-000C0G0100F
C1888	290-0527-00		CAP., FXD, ELCTLT:15UF, 20%, 20V	90201	TDC156M020FL
C1890	290-0145-00		CAP., FXD, ELCTLT:10UF, +75-10%, 50V	56289	30D106G050CB4
C1902	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1910	283-0177-00		CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039651105Z
C1951	283-0177-00		CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039651105Z
C1962	283-0003-00		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-547E103Z
C1970	283-0594-00		CAP., FXD, MICA D:0.001UF, 1%, 100V	00853	D151F102F0
C1972	283-0598-00		CAP., FXD, MICA D:253PF, 5%, 300V	00853	D153E2530J0
C1981	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C1982	283-0024-00		CAP., FXD, CER DI:0.1UF, +80-20%, 30V	56289	273C16
C2065	283-0111-00		CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8131N075651104M
C2835	283-0641-00		CAP., FXD, MICA D:180PF, 1%, 100V	00853	D151E181F0
C2890	283-0630-00		CAP., FXD, MICA D:110PF, 1%, 100V	00853	D151E111F0
C2891	281-0097-00		CAP., VAR, CER DI:9-35PF, W/PC MTG	72982	538-006E2P094R
C3110	283-0010-00		CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C3112	290-0536-00		CAP., FXD, ELCTLT:10UF, 20%, 25V	90201	TDC106M025FL
C3130	290-0644-00		CAP., FXD, ELCTLT:1400UF, +75-10%, 30V	00853	066HL14240308
C3150	290-0644-00		CAP., FXD, ELCTLT:1400UF, +75-10%, 30V	00853	066HL14240308
C3189	283-0010-00		CAP., FXD, CER DI:0.05UF, +100-20%, 50V	56289	273C20
C3220	290-0274-00		CAP., FXD, ELCTLT:80UF, +75-10%, 50V	56289	600D806G050DJ4
C3275	283-0267-00		CAP., FXD, CER DI:0.01UF, 20%, 500V	72982	841-541C103M
C3289	290-0536-00		CAP., FXD, ELCTLT:10UF, 20%, 25V	90201	TDC106M025FL
C3350	283-0531-00		CAP., FXD, MICA D:0.0039UF, 5%, 500V	72136	CM30C392J
C3395	285-0684-00		CAP., FXD, PLSTC:0.056UF, 5%, 100V	01002	64F22AC563

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Discont		Code	Mfr Part Number
C3412	290-0167-00			CAP., FXD, ELCTLT: 10UF, 20%, 15V	56289	150D106X001582
C3440	290-0117-00			CAP., FXD, ELCTLT: 50UF, +75-10%, 50V	56289	30D506G050DD4
C3453	283-0187-00			CAP., FXD, CER DI: 0.047UF, 10%, 400V	72982	8131N401X5R473K
C3459	283-0187-00			CAP., FXD, CER DI: 0.047UF, 10%, 400V	72982	8131N401X5R473K
C3730	285-0509-01			CAP., FXD, PLSTC: 0.0068UF, 20%, 5000V	99217	SEC3159-2
C3731	285-0509-01			CAP., FXD, PLSTC: 0.0068UF, 20%, 5000V	99217	SEC3159-2
C3780	283-0006-00			CAP., FXD, CER DI: 0.02UF, +80-20%, 500V	71590	DA049-2278
CR1110	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1122	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1148	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1164	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1168	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1225	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1235	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1244	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1255	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1304	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1329	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1335	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1362	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1401	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1413	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1434	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1483	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1484	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1535	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1552	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1663	152-0269-00			SEMICONV DEVICE: SILICON, VAR VCAP., 4V, 33PF	25403	1N3182
CR1671	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR1876	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3009	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3010	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3030	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3050	152-0488-00			SEMICONV DEVICE: SILICON, 200V, 1500MA	14936	KBP-02-8
CR3070	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3075	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3180	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3308	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3380	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3408	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 150MA	07910	CD8220
CR3545	152-0413-00			SEMICONV DEVICE: SILICON, 400V, 750MA	04713	MR814
CR3750	152-0408-00			SEMICONV DEVICE: 10KV, 5MA	83003	H345
CR3925	152-0107-00			SEMICONV DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
CR3930	152-0107-00			SEMICONV DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
CR3935	152-0107-00			SEMICONV DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
CR3939	152-0107-00			SEMICONV DEVICE: SILICON, 375V, 400MA	80009	152-0107-00
DS210	150-0123-03			LAMP, CARTRIDGE: 14V, 23MA	18788	390-9-HM631
DS211	150-0123-01			LAMP CARTRIDGE: 14V, 23MA	80009	150-0123-01
F490	159-0042-00			FUSE, CARTRIDGE: 3AG, 0.75A, 250V, FAST-BLOW	71400	AGC3-4
L290	276-0569-00			CORE, TOROID:	80009	276-0569-00
L292	276-0569-00			CORE, TOROID:	80009	276-0569-00
L1118	114-0303-00			COIL, RF: 6.5-23UH, CORE 276-0506-00	80009	114-0303-00

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
L1178	114-0303-00		COIL,RF:6.5-23UH,CORE 276-0506-00	80009	114-0303-00
L1290	108-0317-00		COIL,RF: 15UH	32159	71501M
L1305	114-0339-00		COIL,VAR:40-80UH	80009	114-0339-00
L1636	108-0317-00		COIL,RF: 15UH	32159	71501M
L1666	114-0222-00		COIL,RF:2-6UH,CORE 276-0568-00	80009	114-0222-00
L1770	108-0317-00		COIL,RF: 15UH	32159	71501M
L1821	114-0311-00		COIL,RF:65-190UH,CORE 276-0568-00	80009	114-0311-00
L1827	114-0310-00		COIL,RF76-0096-00	80009	114-0310-00
L1841	114-0311-00		COIL,RF:65-190UH,CORE 276-0568-00	80009	114-0311-00
L1847	114-0310-00		COIL,RF76-0096-00	80009	114-0310-00
L3430	108-0473-00		COIL,RF:150UH	80009	108-0473-00
Q425	151-0405-00		TRANSISTOR:SILICON,NPN,SEL FROM MJE800	04713	SJE943
Q427	151-0429-00		TRANSISTOR:SILICON,PNP	80009	151-0429-00
Q428	151-0423-00		TRANSISTOR:SILICON,NPN	01295	TIP50
Q430	151-0140-00		TRANSISTOR:SILICON,NPN	02735	36568
Q1032	151-1005-00		TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	U1490
Q1034	151-0438-00		TRANSISTOR:SILICON,SEL FROM SPS6927	80009	151-0438-00
Q1036	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800
Q1082	151-1005-00		TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	U1490
Q1084	151-0438-00		TRANSISTOR:SILICON,SEL FROM SPS6927	80009	151-0438-00
Q1086	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800
Q1110	151-0207-00		TRANSISTOR:SILICON,NPN	03508	GET3415
Q1120	151-0207-00		TRANSISTOR:SILICON,NPN	03508	GET3415
Q1140	151-0207-00		TRANSISTOR:SILICON,NPN	03508	GET3415
Q1160	151-0207-00		TRANSISTOR:SILICON,NPN	03508	GET3415
Q1180	151-0207-00		TRANSISTOR:SILICON,NPN	03508	GET3415
Q1201	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1222	151-0223-00		TRANSISTOR:SILICON,PNP	07263	S24848
Q1227	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1233	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1253	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1318	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1332	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1342	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1345	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1348	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1355	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1359	151-0164-00		TRANSISTOR:SILICON,PNP	01295	SKB3334
Q1362	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q1364	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1372	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1397	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1398	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1410	151-0325-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q1412	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800
Q1432	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1433	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1462	151-0103-00		TRANSISTOR:SILICON,NPN	04713	2N2219A
Q1472A,B	151-0236-00		TRANSISTOR:SILICON,NPN	15818	SA2700
Q1476	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1477	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1502	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q1512	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1513	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1528	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1531	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1543	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1570	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1573	151-0325-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q1579	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1584	151-0325-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q1595	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1605	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1680	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1718	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1739	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1781	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q1782	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1801	151-0302-00		TRANSISTOR:SILICON,NPN	04713	2N2222A
Q1811	151-1005-00		TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	U1490
Q1855	151-1005-00		TRANSISTOR:SILICON,JFE,N-CHANNEL	15818	U1490
Q1865	151-0325-00		TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q1927	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1928	151-0220-00		TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q1929	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800
Q1933	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1935	151-0220-00		TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q1937	151-0195-00		TRANSISTOR:SILICON,NPN	04713	SPS8800
Q1963	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1973	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S24848
Q1995	151-0302-00		TRANSISTOR:SILICON,NPN	04713	2N2222A
Q2655A,B	151-0232-00		TRANSISTOR:SILICON,NPN,DUAL	12040	NS7348
Q2700	151-0279-00		TRANSISTOR:SILICON,NPN	07263	S025381
Q2735	151-0279-00		TRANSISTOR:SILICON,NPN	07263	S025381
Q2775	151-0279-00		TRANSISTOR:SILICON,NPN	07263	S025381
Q2795	151-0279-00		TRANSISTOR:SILICON,NPN	07263	S025381
Q3018	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3019	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q3080	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3088	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q3279	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3380	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q3905	151-0350-00		TRANSISTOR:SILICON,PNP	04713	SPS6700
R222	311-1678-00		RES.,VAR, NONWIR:20K OHM,20%,1W	01121	12M267
R224	315-0681-00		RES.,FXD,COMP:680 OHM,5%,0.25W	01121	CB6815
R234	321-0144-00		RES.,FXD,FILM:309 OHM,1%,0.125W	75042	CEATO-3090F
R238 ¹					
R410	311-1690-00		RES.,VAR, NONWIR:2M OHM,20%,1W	12697	381-CM40391
R420	311-1691-00		RES.,VAR, NONWIR:5M OHM,20%,1W	12697	381-CM40392
R430	311-1689-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	01121	W8238
R440	311-1689-00		RES.,VAR, NONWIR:50K OHM,20%,0.50W	01121	W8238
R491	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1012	321-0210-00		RES.,FXD,FILM:1.5K OHM,1%,0.125W	75042	CEATO-1501F
R1020	321-0171-00		RES.,FXD,FILM:590 OHM,1%,0.125W	75042	CEATO-5900F

¹ Furnished as a unit with 119-0648-00

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1022	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1024	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1028	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1030	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEATO-1004F
R1032	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEATO-1004F
R1042	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1044	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R1048	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R1056	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1062	321-0171-00		RES.,FXD,FILM:590 OHM,1%,0.125W	75042	CEATO-5900F
R1064	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1068	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1070	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEATO-1004F
R1072	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEATO-1004F
R1074	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1078	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1078	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1082	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1084	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R1094	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEATO-2001F
R1096	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1110	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1112	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1122	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1124	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1134	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1144	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1146	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1174	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1176	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1186	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1188	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1232	315-0623-00		RES.,FXD,COMP:62K OHM,5%,0.25W	01121	CB6235
R1240	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1241	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1246	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1248	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R1255	315-0113-00		RES.,FXD,COMP:11K OHM,5%,0.25W	01121	CB1135
R1256	315-0393-00		RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R1264	315-0914-00		RES.,FXD,COMP:910K OHM,5%,0.25W	01121	CB9145
R1266	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1268	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R1276	315-0361-00		RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R1302	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1305	321-0323-00		RES.,FXD,FILM:22.6K OHM,1%,0.125W	75042	CEATO-2262F
R1312	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1315	315-0562-00		RES.,FXD,COMP:5.6K OHM,5%,0.25W	01121	CB5625
R1317	315-0123-00		RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB1235
R1326	315-0201-00		RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R1327	321-0929-07		RES.,FXD,FILM:2.5K OHM,0.10%,0.125W	91637	MFF1816C25000B
R1328	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R1331	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R1337	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R1339	321-0705-00		RES.,FXD,FILM:41.7K OHM,1%,0.125W	75042	CEATO-4172F

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1345	315-0361-00		RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R1346	321-0268-00		RES.,FXD,FILM:6.04K OHM,1%,0.125W	75042	CEAT0-6041F
R1348	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R1355	315-0561-00		RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R1357	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R1361	315-0303-00		RES.,FXD,COMP:30K OHM,5%,0.25W	01121	CB3035
R1366	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R1368	315-0362-00		RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R1369	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R1370	315-0241-00		RES.,FXD,COMP:240 OHM,5%,0.25W	01121	CB2415
R1373	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1375	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1386	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R1387	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1389	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1390	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R1403	311-1225-00		RES.,VAR,NONWIR:1K OHM,20%,0.50W	80294	3389F-P31-102
R1405	321-0224-00		RES.,FXD,FILM:2.1K OHM,1%,0.125W	75042	CEAT0-2101F
R1407	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1415	321-0272-00		RES.,FXD,FILM:6.65K OHM,1%,0.125W	75042	CEAT0-6651F
R1417	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1425	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1429	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R1437	315-0242-00		RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R1438	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1442	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1443	315-0753-00		RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R1445	315-0122-00		RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R1450	315-0241-00		RES.,FXD,COMP:240 OHM,5%,0.25W	01121	CB2415
R1458	315-0105-00		RES.,FXD,COMP:1M OHM,5%,0.25W	01121	CB1055
R1464	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R1473	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1482	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1483	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1484	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R1485	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1493	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1495	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1496	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1503	315-0681-00		RES.,FXD,COMP:680 OHM,5%,0.25W	01121	CB6815
R1507	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1510	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R1518	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1518	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	BB1825
R1523	315-0242-00		RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R1525	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1550	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R1551	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1553	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1554	311-1272-00		RES.,VAR,NONWIR:100K OHM,10%,0.50K	73138	62PT-355-0
R1555	315-0753-00		RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R1560	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1561	311-0614-00		RES.,VAR,NONWIR:30K OHM,10%,0.20W	80740	62-61-3

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1562	315-0105-00		RES.,FXD,COMP:1M OHM,5%,0.25W	01121	CB1055
R1563	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1564	315-0273-00		RES.,FXD,COMP:27K OHM,5%,0.25W	01121	CB2735
R1565	321-0277-00		RES.,FXD,FILM:7.5K OHM,1%,0.125W	75042	CEATO-7501F
R1568	315-0474-00		RES.,FXD,COMP:470K OHM,5%,0.25W	01121	CB4745
R1572	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R1575	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R1576	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1577	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1582	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1583	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1586	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1588	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1594	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R1602	321-0093-00		RES.,FXD,FILM:90.9 OHM,1%,0.125W	75042	CEATO-90R90F
R1603	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1612	321-0093-00		RES.,FXD,FILM:90.9 OHM,1%,0.125W	75042	CEATO-90R90F
R1615	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R1616	315-0112-00		RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R1622	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R1623	315-0112-00		RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R1625	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R1635	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1645	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1652	311-1272-00		RES.,VAR, NONWIR:100K OHM,10%,0.50K	73138	62PT-355-0
R1653	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R1675	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R1679	315-0273-00		RES.,FXD,COMP:27K OHM,5%,0.25W	01121	CB2735
R1680	315-0273-00		RES.,FXD,COMP:27K OHM,5%,0.25W	01121	CB2735
R1685	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1688	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1689	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R1701	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1702	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1709	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1717	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1720	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEATO-4990F
R1724	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1728	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1730	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R1735	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEATO-4990F
R1739	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1740	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1744	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R1745	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1746	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1747	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1755	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1759	311-0622-00		RES.,VAR, NONWIR:100 OHM,10%,0.50W	80740	62-53-5
R1760	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEATO-4990F
R1776	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1777	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R1781	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025

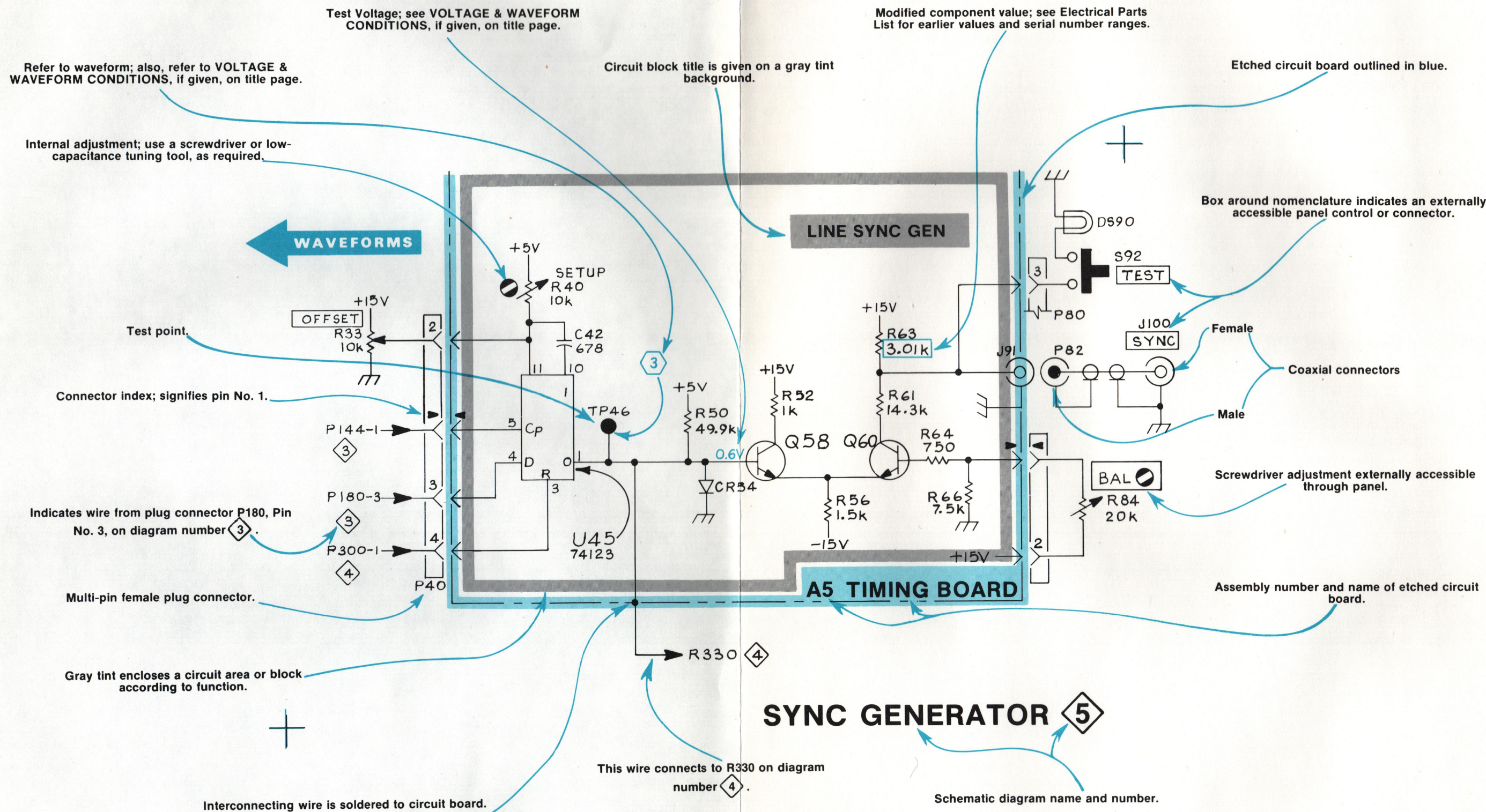
Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1783	315-0105-00		RES., FXD, COMP: 1M OHM, 5%, 0.25W	01121	CB1055
R1800	315-0472-00		RES., FXD, COMP: 4.7K OHM, 5%, 0.25W	01121	CB4725
R1826	315-0753-00		RES., FXD, COMP: 75K OHM, 5%, 0.25W	01121	CB7535
R1831	315-0202-00		RES., FXD, COMP: 2K OHM, 5%, 0.25W	01121	CB2025
R1837	315-0153-00		RES., FXD, COMP: 15K OHM, 5%, 0.25W	01121	CB1535
R1839	315-0153-00		RES., FXD, COMP: 15K OHM, 5%, 0.25W	01121	CB1535
R1865	315-0512-00		RES., FXD, COMP: 5.1K OHM, 5%, 0.25W	01121	CB5125
R1870	315-0472-00		RES., FXD, COMP: 4.7K OHM, 5%, 0.25W	01121	CB4725
R1876	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R1902	315-0123-00		RES., FXD, COMP: 12K OHM, 5%, 0.25W	01121	CB1235
R1910	315-0102-00		RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R1912	321-0277-00		RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	75042	CEATO-7501F
R1916	311-0607-00		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	80740	62-59-3
R1920	321-0164-00		RES., FXD, FILM: 499 OHM, 1%, 0.125W	75042	CEATO-4990F
R1921	315-0392-00		RES., FXD, COMP: 3.9K OHM, 5%, 0.25W	01121	CB3925
R1923	315-0202-00		RES., FXD, COMP: 2K OHM, 5%, 0.25W	01121	CB2025
R1924	315-0103-00		RES., FXD, COMP: 10K OHM, 5%, 0.25W	01121	CB1035
R1925	315-0561-00		RES., FXD, COMP: 560 OHM, 5%, 0.25W	01121	CB5615
R1934	315-0103-00		RES., FXD, COMP: 10K OHM, 5%, 0.25W	01121	CB1035
R1940	315-0202-00		RES., FXD, COMP: 2K OHM, 5%, 0.25W	01121	CB2025
R1942	321-0164-00		RES., FXD, FILM: 499 OHM, 1%, 0.125W	75042	CEATO-4990F
R1944	321-0277-00		RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	75042	CEATO-7501F
R1946	315-0753-00		RES., FXD, COMP: 75K OHM, 5%, 0.25W	01121	CB7535
R1947	315-0392-00		RES., FXD, COMP: 3.9K OHM, 5%, 0.25W	01121	CB3925
R1948	315-0561-00		RES., FXD, COMP: 560 OHM, 5%, 0.25W	01121	CB5615
R1951	311-0607-00		RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	80740	62-59-3
R1960	315-0102-00		RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R1962	315-0123-00		RES., FXD, COMP: 12K OHM, 5%, 0.25W	01121	CB1235
R1963	321-0243-00		RES., FXD, FILM: 3.32K OHM, 1%, 0.125W	75042	CEATO-3321F
R1965	315-0102-00		RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R1967	315-0102-00		RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R1969	315-0153-00		RES., FXD, COMP: 15K OHM, 5%, 0.25W	01121	CB1535
R1974	321-0273-00		RES., FXD, FILM: 6.81K OHM, 1%, 0.125W	75042	CEATO-6811F
R1977	321-0361-00		RES., FXD, FILM: 56.2K OHM, 1%, 0.125W	75042	CEATO-5622F
R1985	315-0102-00		RES., FXD, COMP: 1K OHM, 5%, 0.25W	01121	CB1025
R1986	315-0151-00		RES., FXD, COMP: 150 OHM, 5%, 0.25W	01121	CB1515
R2000	308-0241-00		RES., FXD, WW: 22K OHM, 1%, 7W	63743	22027
R2020	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2035	308-0241-00		RES., FXD, WW: 22K OHM, 1%, 7W	63743	22027
R2070	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2075	308-0241-00		RES., FXD, WW: 22K OHM, 1%, 7W	63743	22027
R2095	308-0241-00		RES., FXD, WW: 22K OHM, 1%, 7W	63743	22027
R2230	315-0103-00		RES., FXD, COMP: 10K OHM, 5%, 0.25W	01121	CB1035
R2250	321-0297-00		RES., FXD, FILM: 12.1K OHM, 1%, 0.125W	75042	CEATO-1212F
R2256	321-0239-00		RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	75042	CEATO-3011F
R2290	315-0103-00		RES., FXD, COMP: 10K OHM, 5%, 0.25W	01121	CB1035
R2520	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2535	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2540	321-0131-00		RES., FXD, FILM: 226 OHM, 1%, 0.125W	75042	CEATO-2260F
R2560	321-0131-00		RES., FXD, FILM: 226 OHM, 1%, 0.125W	75042	CEATO-2260F
R2590	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2595	315-0101-00		RES., FXD, COMP: 100 OHM, 5%, 0.25W	01121	CB1015
R2615	321-0179-00		RES., FXD, FILM: 715 OHM, 1%, 0.125W	75042	CEATO-7150F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R2630	321-0179-00		RES.,FXD,FILM:715 OHM,1%,0.125W	75042	CEATO-7150F
R2685	321-0179-00		RES.,FXD,FILM:715 OHM,1%,0.125W	75042	CEATO-7150F
R2692	321-0179-00		RES.,FXD,FILM:715 OHM,1%,0.125W	75042	CEATO-7150F
R2720	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R2780	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R3008	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R3019	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R3079	315-0303-00		RES.,FXD,COMP:30K OHM,5%,0.25W	01121	CB3035
R3090	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R3100	321-0250-00		RES.,FXD,FILM:3.92K OHM,1%,0.125W	75042	CEATO-3921F
R3115	311-1224-00		RES.,VAR, NONWIR:500 OHM,20%,0.50W	80294	3389F-P31-501
R3122	321-0243-00		RES.,FXD,FILM:3.32K OHM,1%,0.125W	75042	CEATO-3321F
R3170	315-0392-00		RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R3182	321-0251-00		RES.,FXD,FILM:4.02K OHM,1%,0.125W	75042	CEATO-4021F
R3186	321-0251-00		RES.,FXD,FILM:4.02K OHM,1%,0.125W	75042	CEATO-4021F
R3210	315-0112-00		RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R3276	315-0243-00		RES.,FXD,COMP:24K OHM,5%,0.25W	01121	CB2435
R3280	323-0414-00		RES.,FXD,FILM:200K OHM,1%,0.50W	75042	CECTO-2003F
R3288	321-0308-00		RES.,FXD,FILM:15.8K OHM,1%,0.125W	75042	CEATO-1582F
R3309	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R3310	308-0245-00		RES.,FXD,WW:0.6 OHM,5%,2W	91637	RS2B162ER6000J
R3369	315-0392-00		RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R3375	315-0123-00		RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB1235
R3379	315-0393-00		RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R3388	308-0245-00		RES.,FXD,WW:0.6 OHM,5%,2W	91637	RS2B162ER6000J
R3455	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R3468	311-1252-00		RES.,VAR, NONWIR:500 OHM,20%,0.50W	80294	3389F-P31-504
R3475	315-0154-00		RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R3480	315-0154-00		RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R3550	305-0755-00		RES.,FXD,COMP:7.5M OHM,5%,2W	01121	HB7555
R3570	305-0755-00		RES.,FXD,COMP:7.5M OHM,5%,2W	01121	HB7555
R3580	305-0755-00		RES.,FXD,COMP:7.5M OHM,5%,2W	01121	HB7555
R3660	305-0755-00		RES.,FXD,COMP:7.5M OHM,5%,2W	01121	HB7555
R3750	301-0223-00		RES.,FXD,COMP:22K OHM,5%,0.50W	01121	EB2235
R3769	311-1257-00		RES.,VAR, NONWIR:5M OHM,20%,0.50W	80294	3389F-P32-505
R3789	303-0565-00		RES.,FXD,COMP:5.6M OHM,5%,1W	01121	GB5655
R3820	301-0274-00		RES.,FXD,COMP:270K OHM,5%,0.50W	01121	EB2745
R3910	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R3915	301-0224-00		RES.,FXD,COMP:220K OHM,5%,0.50W	01121	EB2245
R3920	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R3940	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
S241	260-1613-00		SWITCH, LEVER: PHASE REF	80009	260-1613-00
S245	260-0490-00		SWITCH, LEVER:	80009	260-0490-00
S445	260-0834-00		SWITCH, TOGGLE: DPDT, 5A, 125VAC, 0.25-40 THD	09353	7201-SN
T230	119-0648-00		GONIOMETER, ELEC: 4.43MHZ	80009	119-0648-00
T430	120-0940-00		XFMR, PWR, SDN & SU:	80009	120-0940-00
T1465	120-0526-00		XMFR, TOROID: 12 T QUAD	80009	120-0526-00
T3510	120-0941-00		XFMR, HV, SDN & SU:	80009	120-0941-00
U1540A,B	156-0158-00		MICROCIRCUIT, LI: DUAL OPERATIONAL AMPLIFIER	18324	S5558V
U1548	156-0067-00		MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	07263	UA741
U1614	156-0041-00		MICROCIRCUIT, DI: DUAL D-TYPE FLIP-FLOP	27014	DM7474N

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Discont		Code	Mfr Part Number
U1715	156-0130-00			MICROCIRCUIT,LI: BALANCED MODEM	04713	MC1496G
U1755	156-0130-00			MICROCIRCUIT,LI: BALANCED MODEM	04713	MC1496G
U1915	156-0356-00			MICROCIRCUIT,LI: OPERATION AMPLIFIER	02735	CA3080
U1950	156-0356-00			MICROCIRCUIT,LI: OPERATION AMPLIFIER	02735	CA3080
V411	154-0720-10			ELECTRON TUBE:	80009	154-0720-10
VR1325	152-0166-00			SEMICON D DEVICE: ZENER, 0.4W, 6.2V, 5%	81483	69-9035
VR1839	152-0166-00			SEMICON D DEVICE: ZENER, 0.4W, 6.2V, 5%	81483	69-9035
VR1932	152-0166-00			SEMICON D DEVICE: ZENER, 0.4W, 6.2V, 5%	81483	69-9035
VR1986	152-0175-00			SEMICON D DEVICE: ZENER, 0.4W, 5.6V, 5%	04713	1N752A
VR3020	152-0166-00			SEMICON D DEVICE: ZENER, 0.4W, 6.2V, 5%	81483	69-9035
VR3760	152-0287-00			SEMICON D DEVICE: ZENER, 0.4W, 110V, 5%	04713	1N986B
Y1670	158-0075-00			XTAL UNIT, QTZ: 3.579545 MHZ, +/- 0.0035%	75378	TX-005-B





DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

This section of the manual contains block and schematic diagrams with waveforms and etched circuit board illustrations.

Symbols

Symbols used on the diagrams are based on ANSI Y32.2-1970 and IEEE No. 315 March 1971. Logic symbology is based on MIL-STD-806B. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μ F).

Resistors = Ohms (Ω).

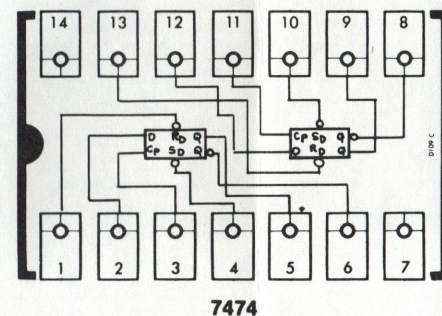
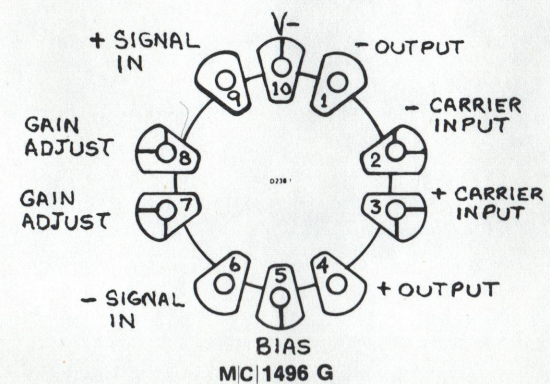
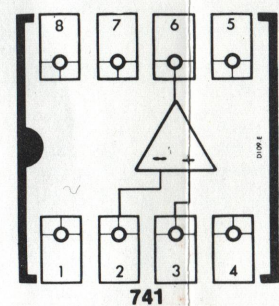
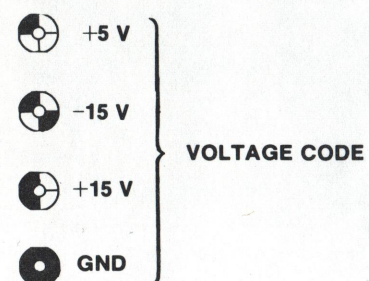
Semiconductor Types

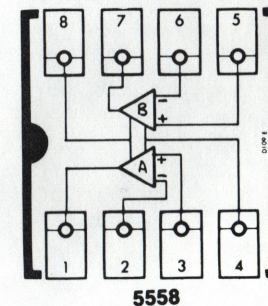
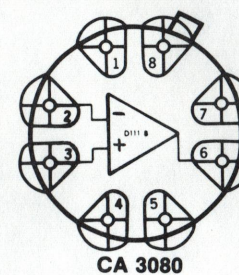
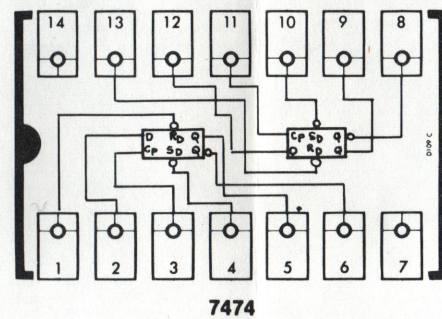
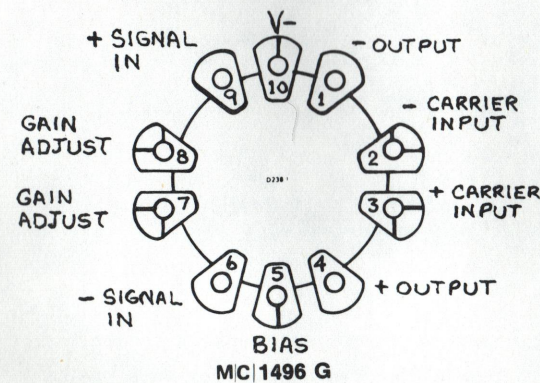
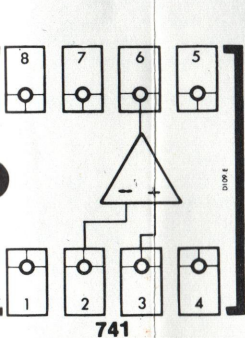
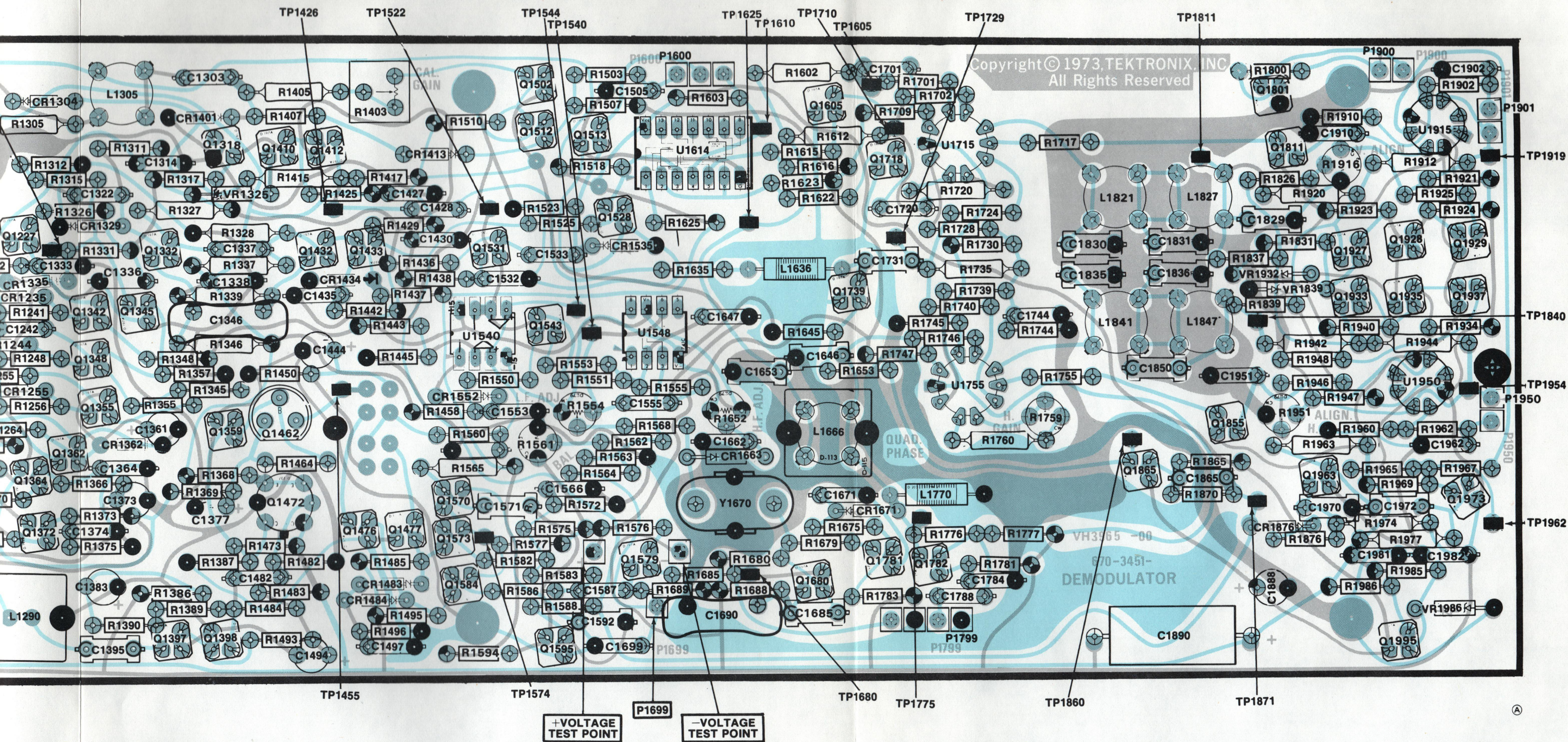
Refer to the Electrical Parts List.

Reference Designators

The following prefix letters are used as reference designators to identify components or assemblies on Tektronix, Inc. schematic diagrams.

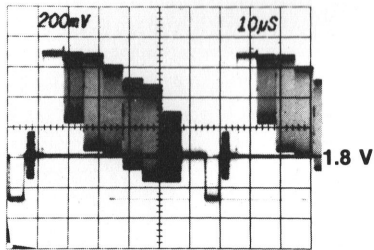
A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	P	Connector, movable portion
BT	Battery	Q	Transistor, silicon-controlled rectifier, or programmable unijunction transistor
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CR	Diode, signal or rectifier	RT	Thermistors
DH	Decoupling Hybrid	S	Switch
DL	Delay Line	T	Transformer
DS	Indicating device (lamp)	TC	Thermocouple
E, SG	Spark Gap	TP	Test point
F	Fuse	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
FL	Filter	V	Electron tube
H	Heat dissipating device (heat sink, heat radiator, etc.)	VR	Voltage regulator (zener diode, etc.)
HR	Heater	Y	Crystal
J	Connector, stationary portion		
K	Relay		
L	Inductor, fixed or variable		





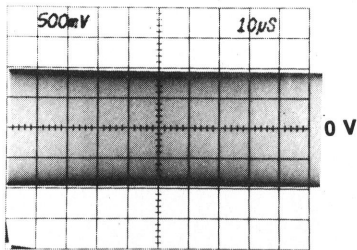
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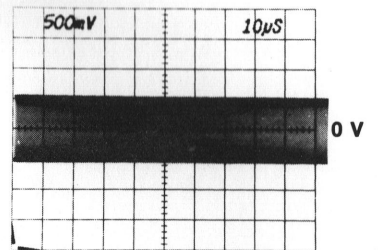
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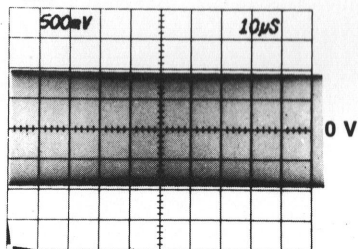
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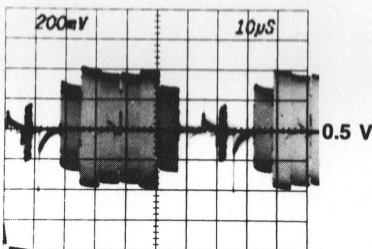
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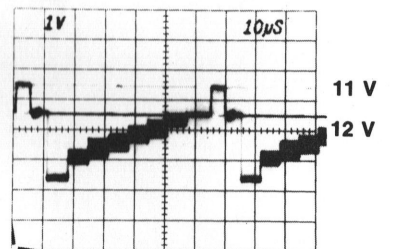
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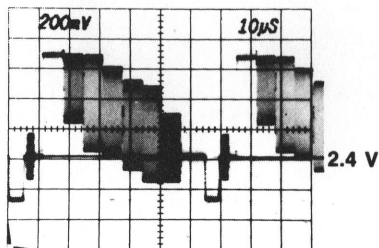
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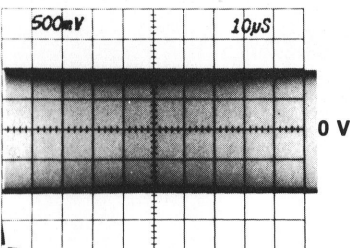
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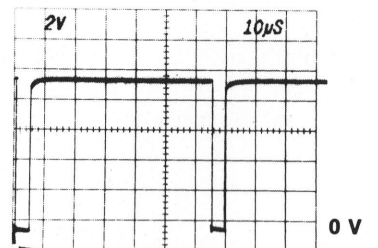
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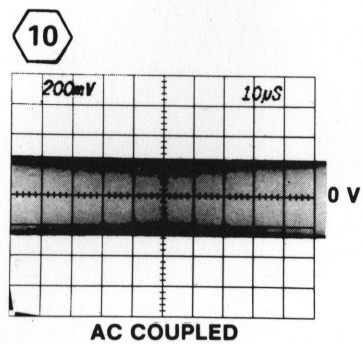
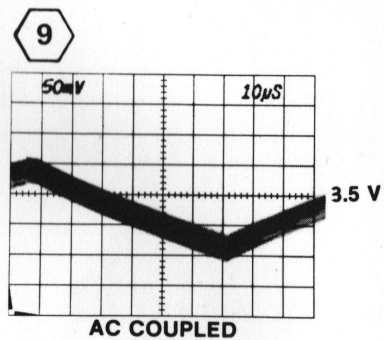
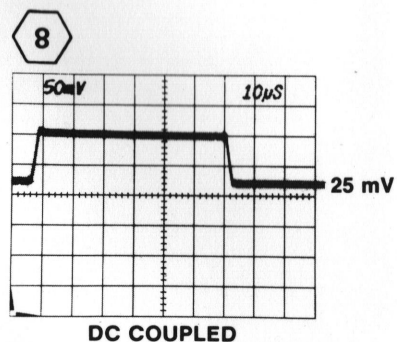
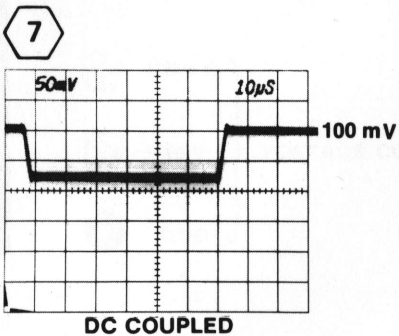
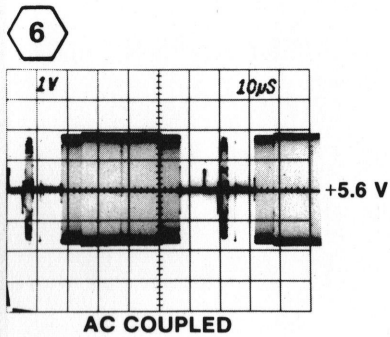
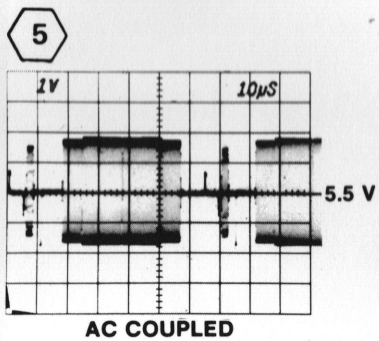
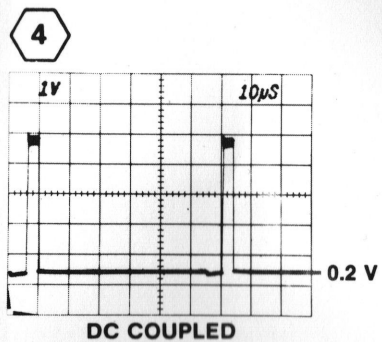
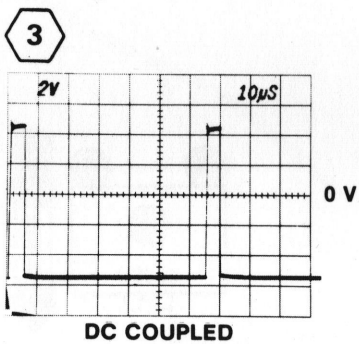
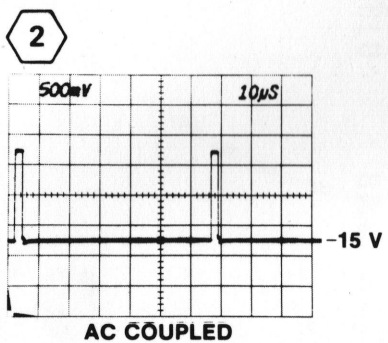
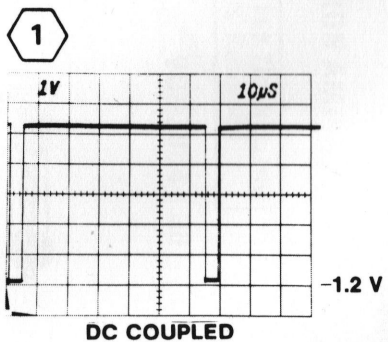
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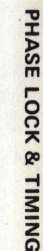
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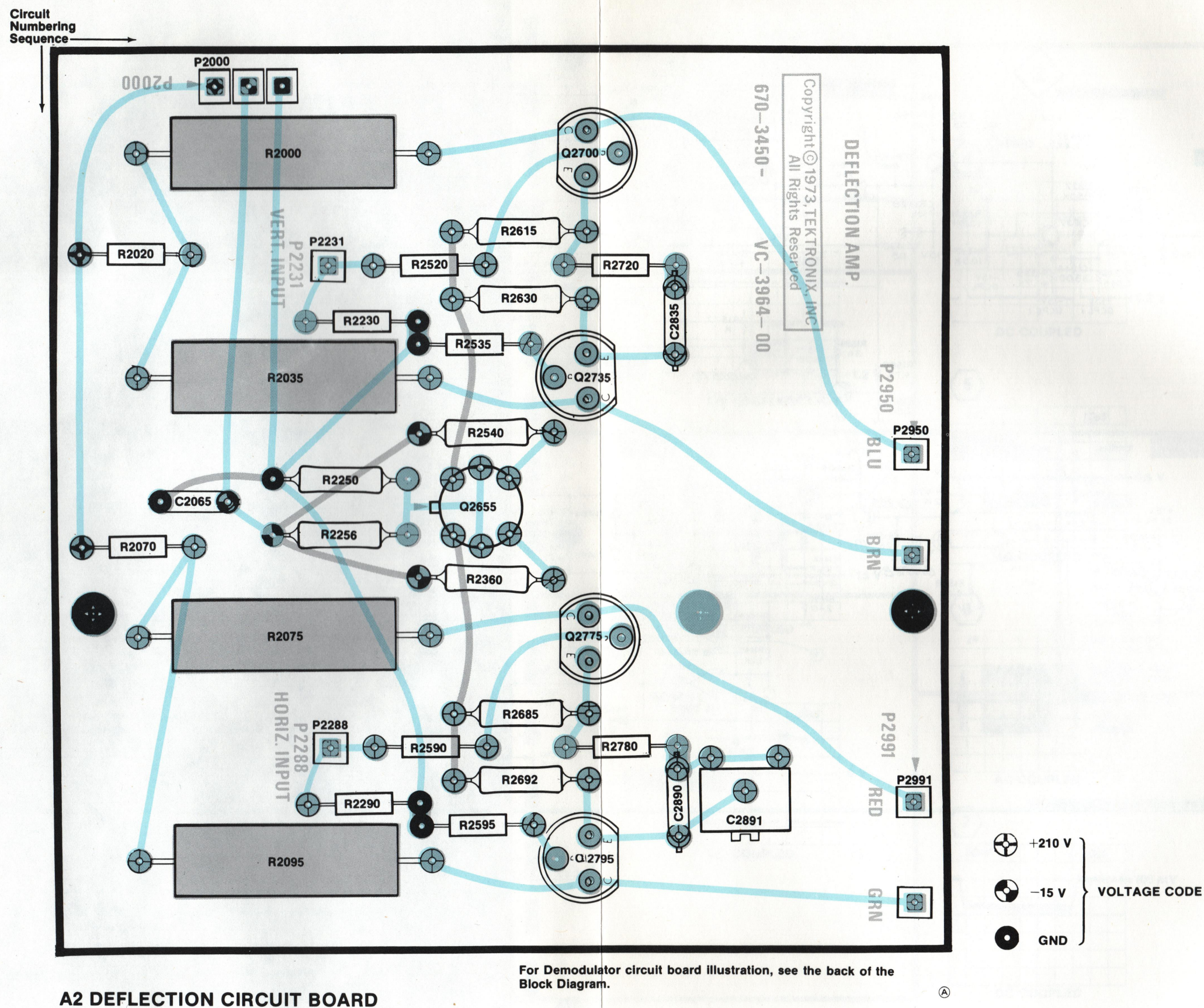


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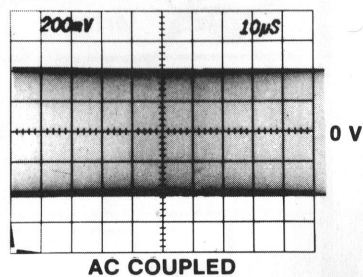




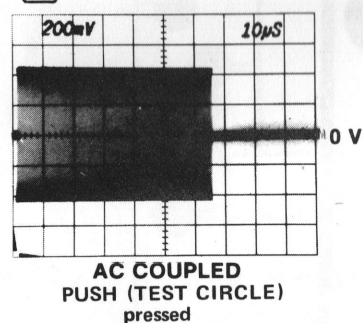


For Demodulator circuit board illustration, see the back of the Block Diagram.

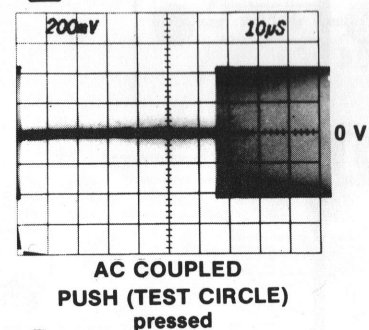
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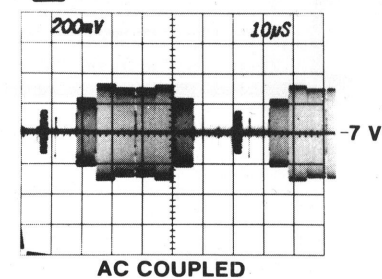
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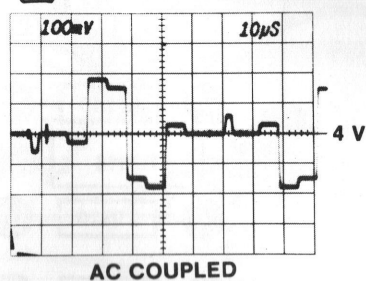


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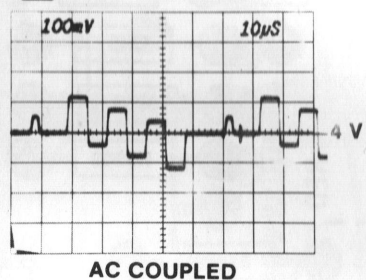


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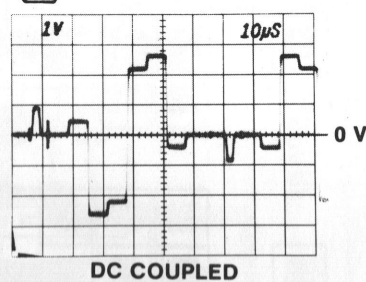
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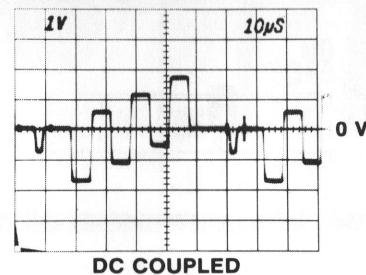
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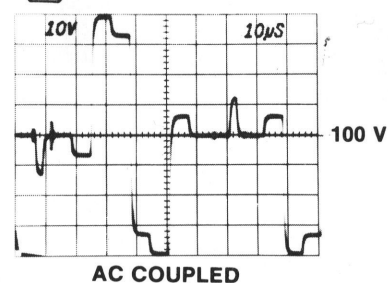
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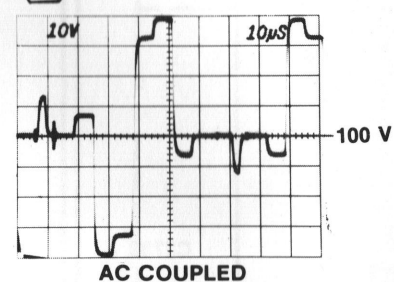
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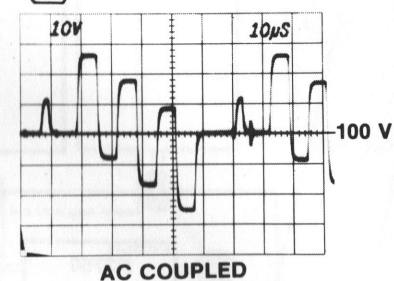
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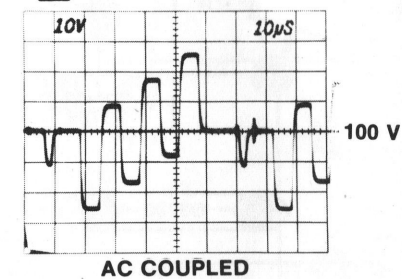
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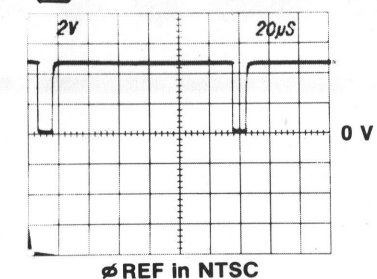
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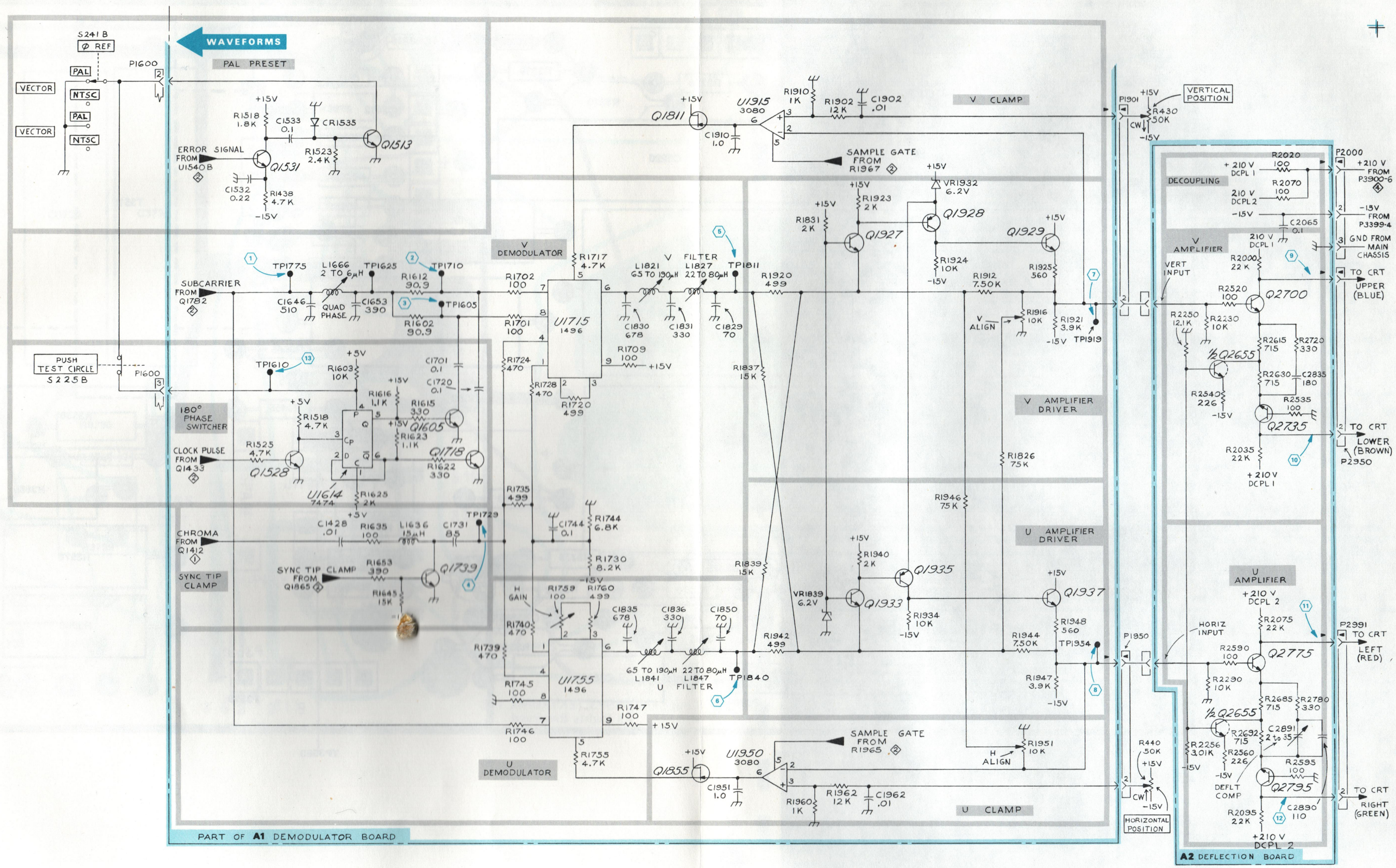


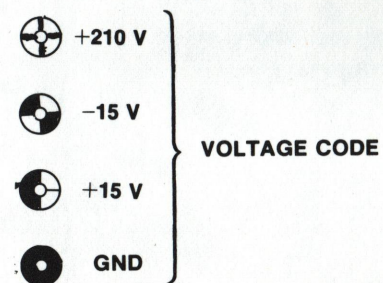
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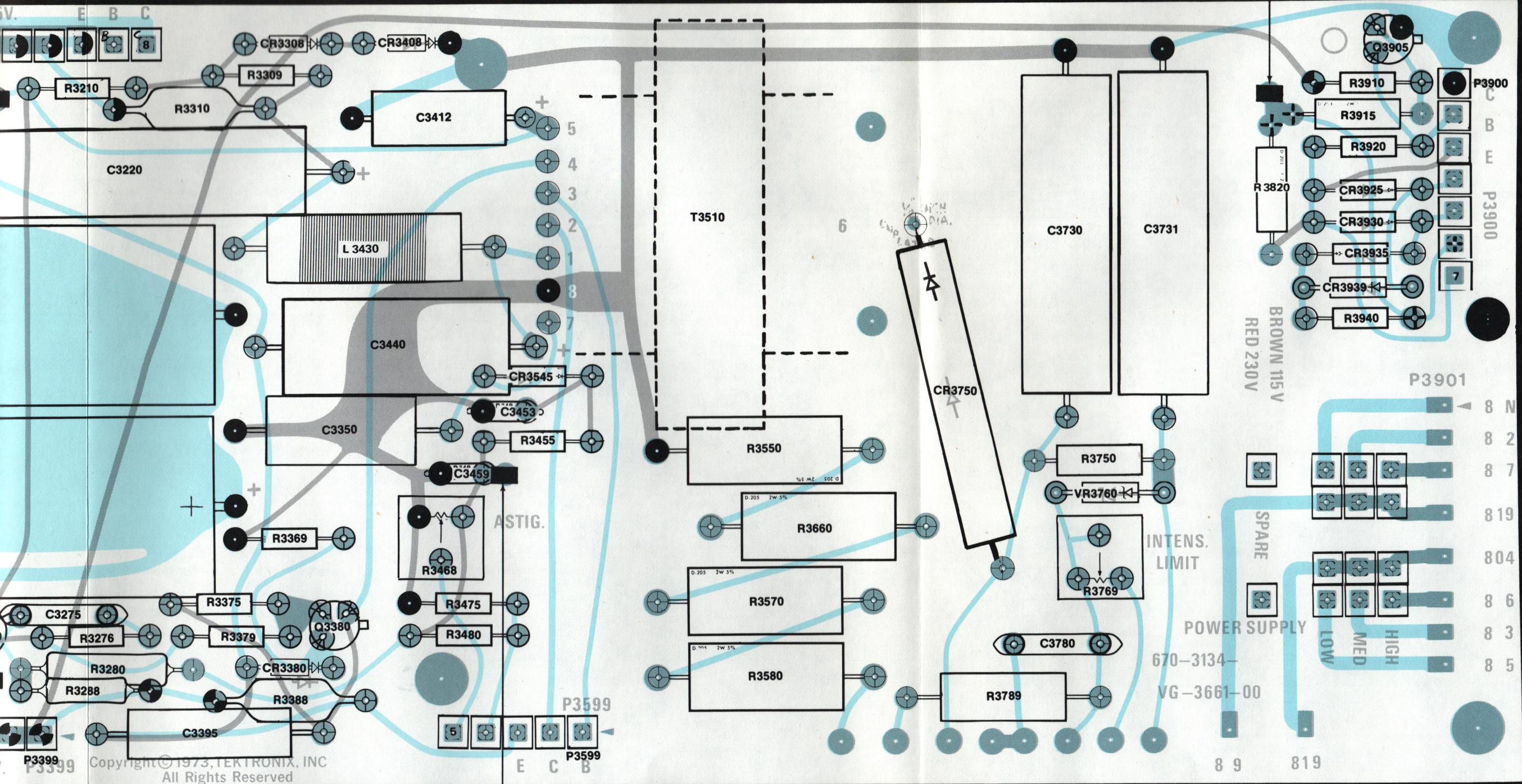


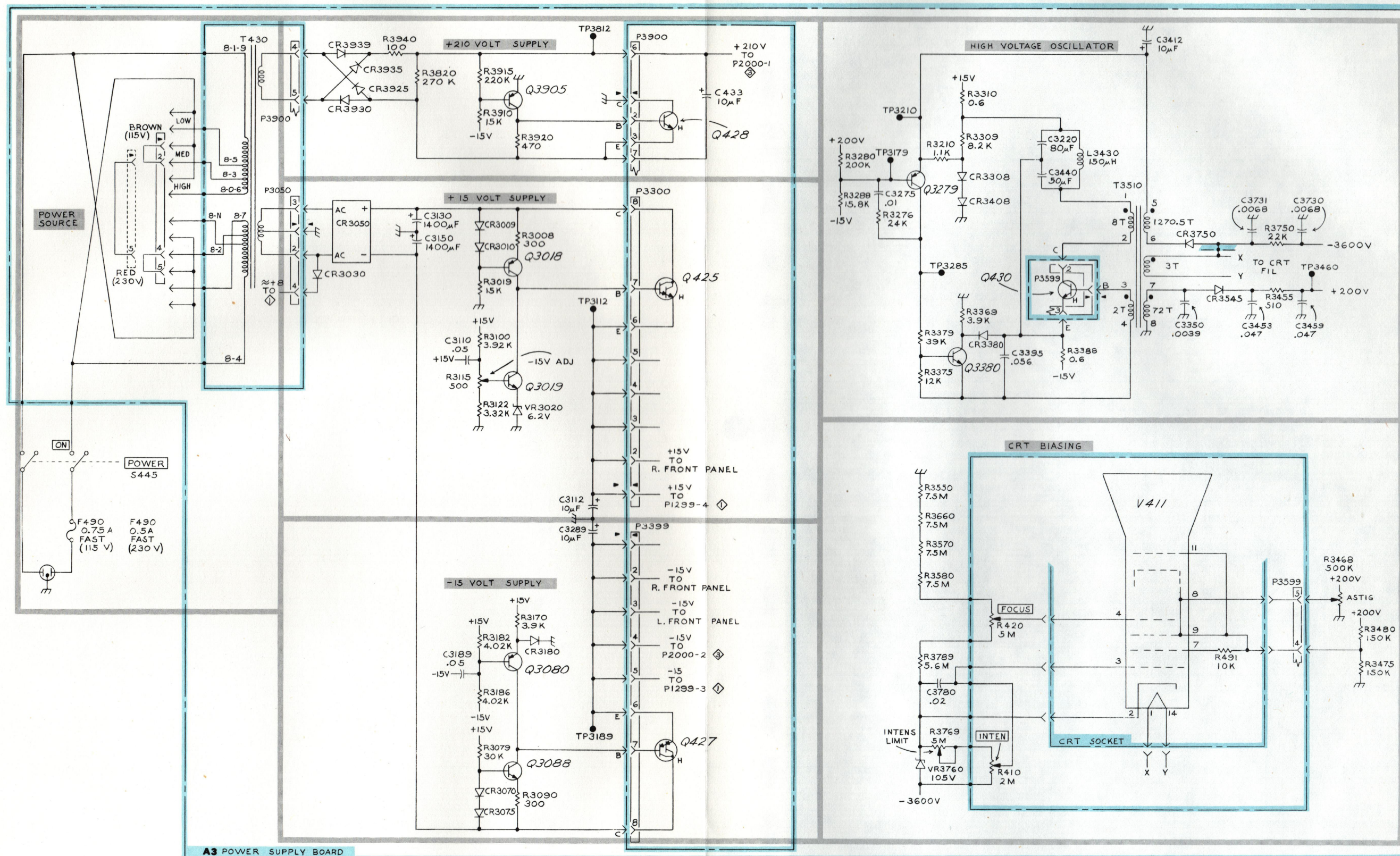
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A3 POWER SUPPLY BOARD

MECHANICAL REPLACEABLE PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00779	AMP, Inc.	P. O. Box 3608	Harrisburg, PA 17105
00866	Goe Engineering Co., Inc.	P. O. Box 3485	City of Industry, CA 91746
06229	Electrovert, Inc.	86 Hartford Ave.	Mount Vernon, NY 10553
06982	Moore, Howard J., Co.	105 E. 16th St.	New York, NY 10003
09353	C and K Components, Inc.	103 Morse Street	Watertown, MA 02172
12136	Philadelphia Handle Co., Inc.	1643 Haddon Ave.	Camden, NJ 08103
12327	Freeway Washer and Stamping Co.	P. O. Box 05206	Cleveland, OH 44105
18788	General Illumination Inc.	2233 University Ave.	St. Paul, MN 55114

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5      Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
    --- * ---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    --- * ---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    --- * ---
  
```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol --- * --- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
22526	Berg Electronics, Inc.	Youk Expressway	New Cumberland, PA 17070
23499	Gavitt Wire and Cable, Division of Amerace Esna Corp.	455 N. Quince St. 3560 Madison Ave.	Escondido, CA 92025 Indianapolis, IN 46227
24931	Specialty Connector Co., Inc.	147 N. Michigan Ave.	Kenilworth, NJ 07033
28520	Heyman Mfg. Co.	571 W. Polk St.	Chicago, IL 60607
70485	Atlantic India Rubber Works, Inc.	415 S. Kilpatrick	Chicago, IL 60644
70903	Belden Corp.	1501 Morse Ave.	Elk Grove Village, IL 60007
71785	TRW Electronic Components, Cinch Connector Operations	446 Morgan St.	Cincinnati, OH 45206
73743	Fischer Special Mfg. Co.	31 Brook St. West	Hartford, CT 06110
74445	Holo-Krome Co.	4001 Benefit Ave.	Ashtabula, OH 44004
74921	Iten Fibre Co., The	800 E. Northwest Hwy	Des Plaines, IL 60016
75915	Littelfuse, Inc.	P. O. Box 1222	City of Industry, CA 91747
76530	TRW Electronic Components, Cinch Monadnock Div.	5700 W. Roosevelt Rd.	Chicago, IL 60650
77250	Pheoll Manufacturing Co., Division of Allied Products Corp.	St. Charles Road	Elgin, IL 60126
78189	Illinois Tool Works, Inc. Shakeproof Division	2100 S. O Bay St.	Milwaukee, WI 53207
79807	Wrought Washer Mfg. Co.	P. O. Box 500	Beaverton, OR 97005
80009	Tektronix, Inc.	P. O. Box 278-1345 Miami St.	Toledo, OH 43605
80033	Prestole Everlock, Inc.	34 Forest St.	Attleboro, MA 02703
82647	Texas Instruments, Inc., Control Products Div.	2530 Crescent Dr.	Broadview, IL 60153
83385	Central Screw Co.		

ABBREVIATIONS

"	INCH	FLH	FLAT HEAD	PWR	POWER
#	NUMBER SIZE	FLTR	FILTER	RCPT	RECEPTACLE
ACTR	ACTUATOR	FR	FRAME or FRONT	RES	RESISTOR
ADPTR	ADAPTER	FSTNR	FASTENER	RDG	RIGID
ALIGN	ALIGNMENT	FT	FOOT	RLF	RELIEF
AL	ALUMINUM	FXD	FIXED	RTNR	RETAINER
ASSEM	ASSEMBLED	GSKT	GASKET	SCH	SOCKET HEAD
ASSY	ASSEMBLY	HDL	HANDLE	SCOPE	OSCILLOSCOPE
ATTEN	ATTENUATOR	HEX	HEXAGON	SCR	SCREW
AWG	AMERICAN WIRE GAGE	HEX HD	HEXAGONAL HEAD	SE	SINGLE END
BD	BOARD	HEX SOC	HEXAGONAL SOCKET	SECT	SECTION
BRKT	BRACKET	HLCPS	HELICAL COMPRESSION	SEMICOND	SEMICONDUCTOR
BRS	BRASS	HLEXT	HELICAL EXTENSION	SHLD	SHIELD
BRZ	BRONZE	HV	HIGH VOLTAGE	SHLDR	SHOULDERED
BSHG	BUSHING	IC	INTEGRATED CIRCUIT	SKT	SOCKET
CAB	CABINET	ID	INSIDE DIAMETER	SL	SLIDE
CAP	CAPACITOR	IDENT	IDENTIFICATION	SLFLKG	SELF-LOCKING
CER	CERAMIC	IMPLR	IMPELLER	SLVG	SLEEVEING
CHAS	CHASSIS	IN	INCH	SPR	SPRING
CKT	CIRCUIT	INCAND	INCANDESCENT	SQ	SQUARE
COMP	COMPOSITION	INSUL	INSULATOR	SST	STAINLESS STEEL
CONN	CONNECTOR	INTL	INTERNAL	STL	STEEL
COV	COVER	LPHLDR	LAMPHOLDER	SW	SWITCH
CPLG	COUPLING	MACH	MACHINE	T	TUBE
CRT	CATHODE RAY TUBE	MECH	MECHANICAL	TERM	TERMINAL
DEG	DEGREE	MTG	MOUNTING	THD	THREAD
DWR	DRAWER	NIP	NIPPLE	THK	THICK
ELECTRN	ELECTRON	NON WIRE	NOT WIRE WOUND	TNSN	TENSION
ELEC	ELECTRICAL	OBD	ORDER BY DESCRIPTION	TPG	TAPPING
ELECTLT	ELECTROLYTIC	OD	OUTSIDE DIAMETER	TRH	TRUSS HEAD
ELEM	ELEMENT	OVH	OVAL HEAD	V	VOLTAGE
EPL	ELECTRICAL PARTS LIST	PH BRZ	PHOSPHOR BRONZE	VAR	VARIABLE
EQPT	EQUIPMENT	PL	PLAIN or PLATE	W/	WITH
EXT	EXTERNAL	PLSTC	PLASTIC	WSHR	WASHER
FIL	FILLISTER HEAD	PN	PART NUMBER	XFMR	TRANSFORMER
FLEX	FLEXIBLE	PNH	PAN HEAD	XSTR	TRANSISTOR

Mechanical Parts List—1421

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	437-0100-01			1		CAB.,ELEC EQUIP:	80009	437-0100-01
	390-0018-01			1		CAB.,ELEC EQUIP:	80009	390-0018-01
						(ATTACHING PARTS)		
	212-0033-00			2		SCREW,MACHINE:8-32 X 0.750 INCH PNH,STL	83385	OBD
	-----			-		* - - - -		
				-		. CABINET INCLUDES:		
-2	105-0074-00			1		. STRIKE,CATCH:REAR,INST SECURE	80009	105-0074-00
						(ATTACHING PARTS)		
-3	210-0457-00			2		. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
						* - - - -		
-4	348-0187-00			4		. FOOT:0.50 INCH DIA	80009	348-0187-00
						(ATTACHING PARTS)		
-5	211-0503-00			4		. SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL	83385	OBD
						* - - - -		
-6	344-0098-00			2		. CLIP,DECORATIVE:HOLD-DOWN,HANDLE	12136	OBD
-7	367-0037-00			1		. HANDLE,LUGGAGE:TEK BLUE	12136	OBD
						(ATTACHING PARTS)		
	213-0155-00			2		. SCREW,MACHINE:10-32 X 0.40 INCH LONG,STL	77250	OBD
						* - - - -		
-8	331-0192-00			1		MASK,CRT SCALE:	80009	331-0192-00
-9	337-1017-00			1		WINDOW,OBS:CLEAR ACRYLIC	80009	337-1017-00
						(ATTACHING PARTS)		
-10	211-0097-00			4		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
						* - - - -		
-11	366-0496-00			1		KNOB:W/SETSCREW	80009	366-0496-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-12	366-1283-00			1		KNOB:W/SETSCREW	80009	366-1283-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-13	366-1541-00			1		PUSH BUTTON:TEST CIRCLE	80009	366-1541-00
-14	366-0215-02			2		KNOB:LEVER SWITCH	80009	366-0215-02
-15	366-1035-02			4		KNOB:FRICT MT,W/SPRING & SKIRT	80009	366-1035-02
-16	333-1872-00			1		PANEL,FRONT:RIGHT	80009	333-1872-00
						(ATTACHING PARTS)		
-17	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						* - - - -		
-18	333-1899-00			1		PANEL,FRONT:LEFT	80009	333-1899-00
						(ATTACHING PARTS)		
-19	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						* - - - -		
-20	386-1304-14			1		SUBPANEL,FRONT:	80009	386-1304-14
						(ATTACHING PARTS)		
-21	129-0462-00			2		POST,ELEC-MECH:0.312 OD X 0.885 INCH LONG	80009	129-0462-00
-22	210-0458-00			2		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
						* - - - -		
-23	354-0314-01			1		RING,CRT SHOCKM:	80009	354-0314-01
						(ATTACHING PARTS)		
-24	211-0590-00			3		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						* - - - -		
-25	-----			4		RES.,VAR:(SEE R410,R420,R430,R440 EPL)		
						(ATTACHING PARTS FOR EACH)		
-26	210-0583-00			1		NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-27	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-28	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						* - - - -		
-29	200-0608-00			2		COVER,VAR RES.:PLASTIC	80009	200-0608-00
-30	260-0834-00			1		SWITCH,TOGGLE:DPDT,5A,125VAC,0.25-40 THD	09353	7201-SN
						(ATTACHING PARTS)		
-31	210-0583-00			1		NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-32	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
						* - - - -		
-33	-----			1		RES.,VAR:(SEE R222 EPL)		
						(ATTACHING PARTS)		
-34	210-0583-00			1		NUT,PLAIN,HEX:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402

Mechanical Parts List—1421

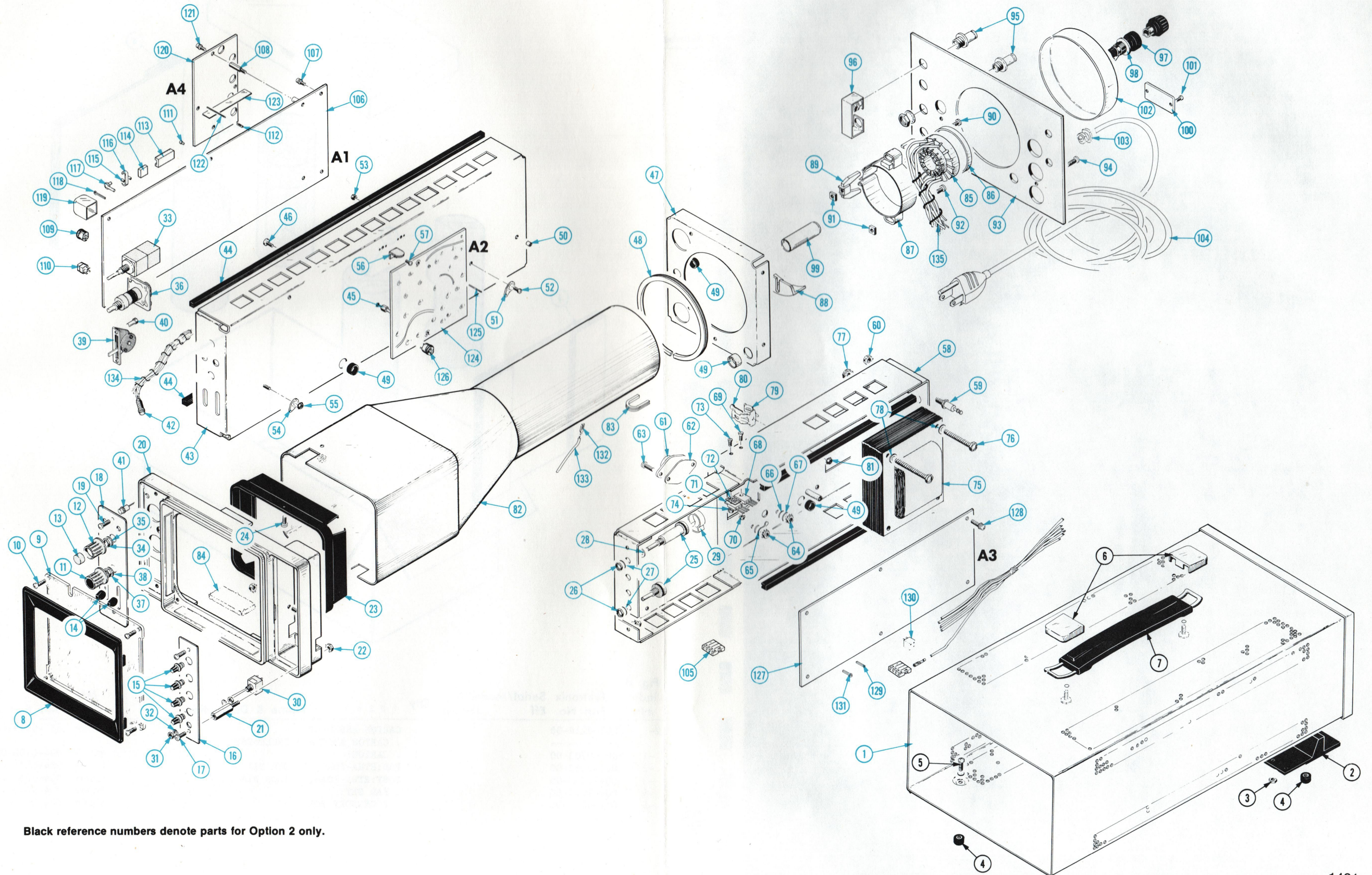
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-35	210-0940-00			1		WASHER, FLAT: 0.25 ID X 0.375 INCH OD, STL	79807	OBD
	210-0807-00			1		WASHER, FLAT: 0.312 ID X 0.625 INCH OD, STL	12327	OBD
-36	-----			1		GONIOMETER, ELEC: (SEE T230 EPL) (ATTACHING PARTS)		
-37	210-0580-00			1		NUT, PLAIN, HEX: 0.312-32 X 0.375 INCH BRS	73743	OBD
-38	210-1025-00			1		WASHER, FLAT: 0.50 ID X 0.312 INCH OD, BRS	12327	OBD
-39	-----			2		SWITCH, LEVER: (SEE S241, S245 EPL) (ATTACHING PARTS FOR EACH)		
-40	220-0413-00			2		NUT, SLEEVE: 4-40 X 0.562 INCH LONG	80009	220-0413-00
-41	150-0123-03			1		LAMP, CARTRIDGE: 14V, 23MA	18788	390-9-HM631
-42	150-0123-01			1		LAMP, CARTRIDGE: 14V, 23MA	80009	150-0123-01
-43	441-0784-01			1		CHAS, ELEC EQUIP:	80009	441-0784-01
-44	255-0249-00			FT		PLASTIC CHANNEL: BLK VINYL	80009	255-0249-00
-45	214-1696-00			2		PIN, GUIDE: 0.50 INCH LONG (ATTACHING PARTS)	80009	214-1696-00
-46	211-0504-00			2		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-47	386-1398-00			1		SUPPORT, CHAS: ALUMINUM (ATTACHING PARTS)	80009	386-1398-00
	211-0504-00			3		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-48	252-0564-00			FT		PLSTC SPL SHAPE:	06229	GS3
-49	348-0063-00			5		GROMMET, PLASTIC: 0.50 INCH DIA	80009	348-0063-00
-50	348-0031-00			2		GROMMET, PLASTIC: 0.156 INCH DIA	80009	348-0031-00
-51	210-0201-00			2		TERMINAL, LUG: SE #4 (ATTACHING PARTS)	78189	2104-04-00-2520N
-52	211-0008-00			2		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-53	210-0586-00			2		NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	OBD
-54	210-0202-00			1		TERMINAL, LUG: SE #6 (ATTACHING PARTS)	78189	2104-06-00-2520N
-55	210-0457-00			1		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-56	344-0133-00			4		CLIP, SPR, TNSN: CIRCUIT BOARD MOUNTING (ATTACHING PARTS)	80009	344-0133-00
-57	213-0138-00			4		SCR, TPG, THD FOR: 4-40 X 0.188 INCH, PNH STL	83385	OBD
-58	441-0785-00			1		CHAS, ELEC EQUIP:	80009	441-0785-00
	210-0202-00			1		TERMINAL, LUG: SE #6 (ATTACHING PARTS)	78189	2104-06-00-2520N
	211-0504-00			1		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
	210-0457-00			1		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-59	129-0006-00			1		TERMINAL, STUD: INSULATED (ATTACHING PARTS)	00866	1700P
-60	210-0457-00			1		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-61	-----			1		TRANSISTOR: (SEE Q430 EPL) (ATTACHING PARTS)		
-62	387-0345-00			1		PLATE, INSULATOR: 1.15 X 1.70 INCH	76530	294457
-63	211-0511-00			2		SCREW, MACHINE: 6-32 X 0.50 INCH, PNH STL	83385	OBD
-64	210-0457-00			2		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-65	210-0202-00			1		TERMINAL, LUG: SE #6	78189	2104-06-00-2520N
-66	210-0935-00			2		WASHER, NONMETAL: FIBER, 0.14 ID X 0.375" OD	74921	253-2
-67	210-0803-00			2		WASHER, FLAT: 0.15 ID X 0.375 INCH OD, STL	12327	OBD
-68	-----			1		TRANSISTOR: (SES Q428 EPL) (ATTACHING PARTS)		
-69	211-0038-00			1		SCREW, MACHINE: 4-40 X 0.312" 100 DEG, FLH STL	83385	OBD
-70	210-0586-00			1		NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	OBD

Mechanical Parts List—1421

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-71	-----	-----		2		TRANSISTOR:(SEE Q425,Q427 EPL) (ATTACHING PARTS FOR EACH)		
-72	342-0163-00			1		INSULATOR,PLATE:XSTR,0.675 X 0.625 X 0.001"	80009	342-0163-00
-73	211-0038-00			1		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
	210-1122-00			1		WASHER,LOCK:DISHED,0.12 ID X 0.375"OD STL	78189	4704-04-02
-74	210-0406-00			1		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
						----- *		
-75	-----	-----		1		TRANSFORMER:(SEE T430 EPL) (ATTACHING PARTS)		
-76	212-0590-00			4		SCREW,MACHINE:10-32 X 1.50 INCH HEX STL	83385	OBD
-77	220-0410-00			4		NUT,EXTENDED WA:10-32 X 0.375INCH,STL	83385	OBD
	166-0432-00			4		SPACER,SLEEVE:	80009	166-0432-00
-78	210-0812-00			4		WASHER,NONMETAL:#10,FIBER	06982	OBD
						----- *		
-79	344-0117-00			1		RTNR,CAPACITOR:CAPACITOR MTG (ATTACHING PARTS)	80033	E50005-041
-80	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-81	210-0586-00			1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						----- *		
-82	337-1011-01			1		SHLD,ELECTRON:	80009	337-1011-01
-83	348-0145-00			1		GROMMET,PLASTIC:U-SHP,1.0 X 0.42 INCH	80009	348-0145-00
-84	348-0090-00			1		CUSHION,CRT:	80009	348-0090-00
-85	136-0202-01			1		SOCKET,PLUG-IN:14 PIN	80009	136-0202-01
-86	200-0616-00			1		COV,ELECTRON TU:	80009	200-0616-00
-87	343-0124-00			1		CLAMP,LOOP:	80009	343-0124-00
-88	352-0091-01			2		RTNR,LOOP CLAMP: (ATTACHING PARTS)	80009	352-0091-01
	211-0600-00			1		SCREW,MACHINE:6-32 X 2 INCH,FIL SST	83385	OBD
	220-0444-00			1		NUT,PLAIN,SQ:6-32 X 0.250 INCH,STL	77250	OBD
						----- *		
-89	343-0123-01			2		CLAMP,RET.,ELEC: (ATTACHING PARTS FOR EACH)	80009	343-0123-01
-90	211-0599-00			1		SCREW,MACHINE:6-32 X 0.750 INCH,FIL SST	83385	OBD
-91	220-0444-00			1		NUT,PLAIN,SQ:6-32 X 0.250 INCH,STL	77250	OBD
-92	211-0590-00			2		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						----- *		
-93	386-3060-00			1		PANEL,REAR:FOR 1420 (ATTACHING PARTS)	80009	386-3060-00
-94	212-0001-00			1		SCREW,MACHINE:8-32 X 0.250 INCH,PNH STL	77250	OBD
	212-0004-00			2		SCREW,MACHINE:8-32 X 0.312 INCH,PNH STL	83385	OBD
	210-0458-00			2		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
						----- *		
-95	131-0955-00			4		CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR200-1
-96	337-2121-00			1		SHIELD,ELEC:LOOP THRU	80009	337-2121-00
-97	352-0362-00			1		FUSEHOLDER: W/MOUNTING HARDWARE (ATTACHING PARTS)	75915	345001
-98	210-0873-00			1		WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
						----- *		
-99	200-0237-00			1		INS HOOD,INS:1.610 INCH LONG	80009	200-0237-00
-100	334-0904-00			1		PL,INSTRUCTION: (ATTACHING PARTS)	80009	334-0904-00
-101	213-0088-00			2		SCR,TPG,THD CTG:4-24 X0.25 INCH,PNH STL	83385	OBD
						----- *		
-102	200-0777-00			1		COV,ACCESS,CRT:	80009	200-0777-00
-103	358-0161-00			1		BSHG,STRAIN RLF:	28520	SR5P4
-104	161-0049-00			1		CABLE ASSY,PWR:	70903	KH5603
-105	352-0200-00			1		HOLDER,TERM.CON:4 WIRE BLACK	80009	352-0200-00
-106	-----	-----		1		CKT BOARD ASSY:DEMULATOR(SEE A1 EPL) (ATTACHING PARTS)		
-107	211-0116-00			4		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-108	129-0354-00			2		POST,ELEC-MECH:0.54 " LONG X 0.188 ",HEX	80009	129-0354-00
						----- *		

Mechanical Parts List—1421

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
	-----		-						. CKT BOARD ASSY INCLUDES:		
	131-0589-00		23						. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-109	136-0183-00		1						. SOCKET,PLUG-IN:3 PIN	80009	136-0183-00
-110	136-0220-00		53						. SOCKET,PLUG-IN:3 PIN	71785	133-23-11-034
	136-0235-00		1						. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
	136-0237-00		2						. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
	136-0241-00		2						. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-111	136-0252-04		33						. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-112	136-0263-04		1						. CONTACT,ELEC:FOR 0.025 SQUARE PIN	22526	15377-001
-113	136-0269-02		1						. SOCKET,PLUG-IN:14 PIN DUAL INLINE	71785	133-59-02-073
-114	136-0514-00		2						. SOCKET,PLUG-IN:MICROCIRCUIT,8 CONTACT	82647	C930802
-115	136-0234-00		2						. CONTACT,ELEC:0.088 OD X 0.247 INCH L	00779	380598-1
-116	352-0096-00		1						. CLIP,SPR,TNSN:CRYSTAL	80009	352-0096-00
-117	352-0134-00		1						. HOLDER,COIL:TOROIDAL,0.472 X 0.417 INCH	80009	352-0134-00
	214-0506-00		1						. CONTACT,ELEC:0.045 SQ X 0.375 INCH L	80009	214-0506-00
-118	214-0579-00		24						. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-119	337-1417-00		2						. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-120	-----		-						. CKT BOARD ASSY:INPUT AMP SHIELD BOARD(SEE A4 EPL) (ATTACHING PARTS)		
-121	211-0116-00		2						. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
	-----		-						. CKT BOARD ASSY INCLUDES:		
-122	131-0591-00		1						. CONTACT,ELEC:0.835 INCH LONG	22526	47352
-123	337-1197-02		1						. SHIELD,ELEC:2.300 X 0.400 INCH	80009	337-1197-02
-124	-----		1						. CKT BOARD ASSY:DEFLECTION BOARD(SEE A2 EPL)		
	-----		-						. CKT BOARD ASSY INCLUDES:		
-125	131-0589-00		9						. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-126	136-0183-00		4						. SOCKET,PLUG-IN:3 PIN	80009	136-0183-00
	136-0235-00		1						. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-127	-----		1						. CKT BOARD ASSY:POWER SUPPLY BOARD(SEE A3 EPL) (ATTACHING PARTS)		
-128	211-0116-00		6						. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
	-----		-						. CKT BOARD ASSY INCLUDES:		
-129	131-0589-00		47						. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-130	136-0220-00		7						. SOCKET,PLUG-IN:3 PIN	71785	133-23-11-034
-131	214-0579-00		7						. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
	131-1683-00		1						. LINK,TERM CONN:BROWN,1-2,4-5	80009	131-1683-00
	131-1684-00		1						. LINK,TERM CONN:RED,1-5	80009	131-1684-00
-132	131-1538-00		4						. CONTACT,ELEC:	22526	75369-009
-133	175-0529-00		FT						. WIRE,ELECTRICAL	23499	TEK 175-0529-00
-134	179-2270-00		1						. WIRING HARNESS:MAIN	80009	179-2270-00
-135	179-2271-00		1						. WIRING HARNESS:HI VOLT	80009	179-2271-00



Black reference numbers denote parts for Option 2 only.

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STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	No. Dscont	Qty	1 2 3 4 5	Name & Description	Mfr	
							Code	Mfr Part Number
2-	011-0102-00			1		TERMN COAX:75 OHM,0.50 W,BNC	80009	011-0102-00
	070-1769-00			1		MANUAL TECH:INSTRUCTION	80009	070-1769-00